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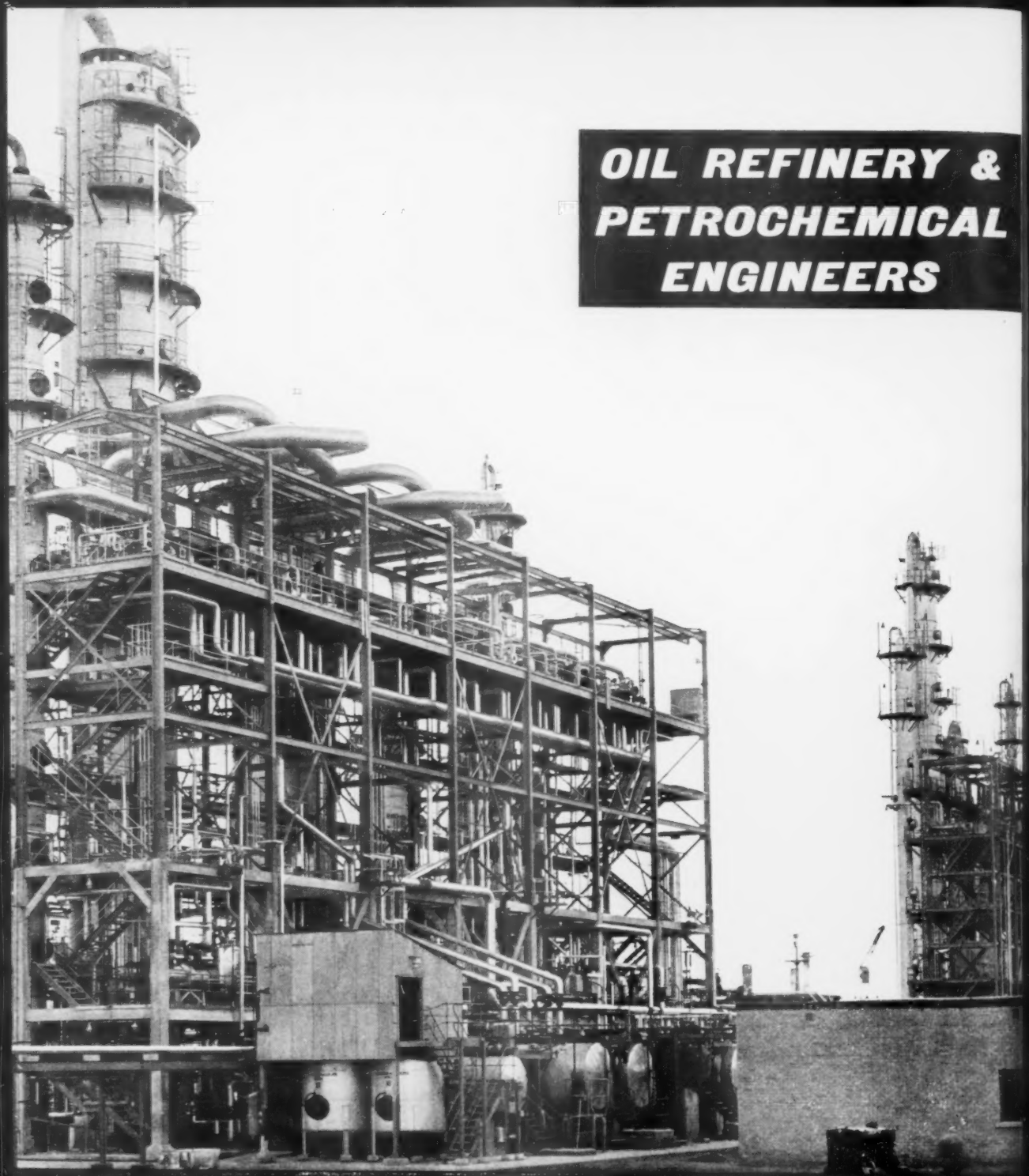

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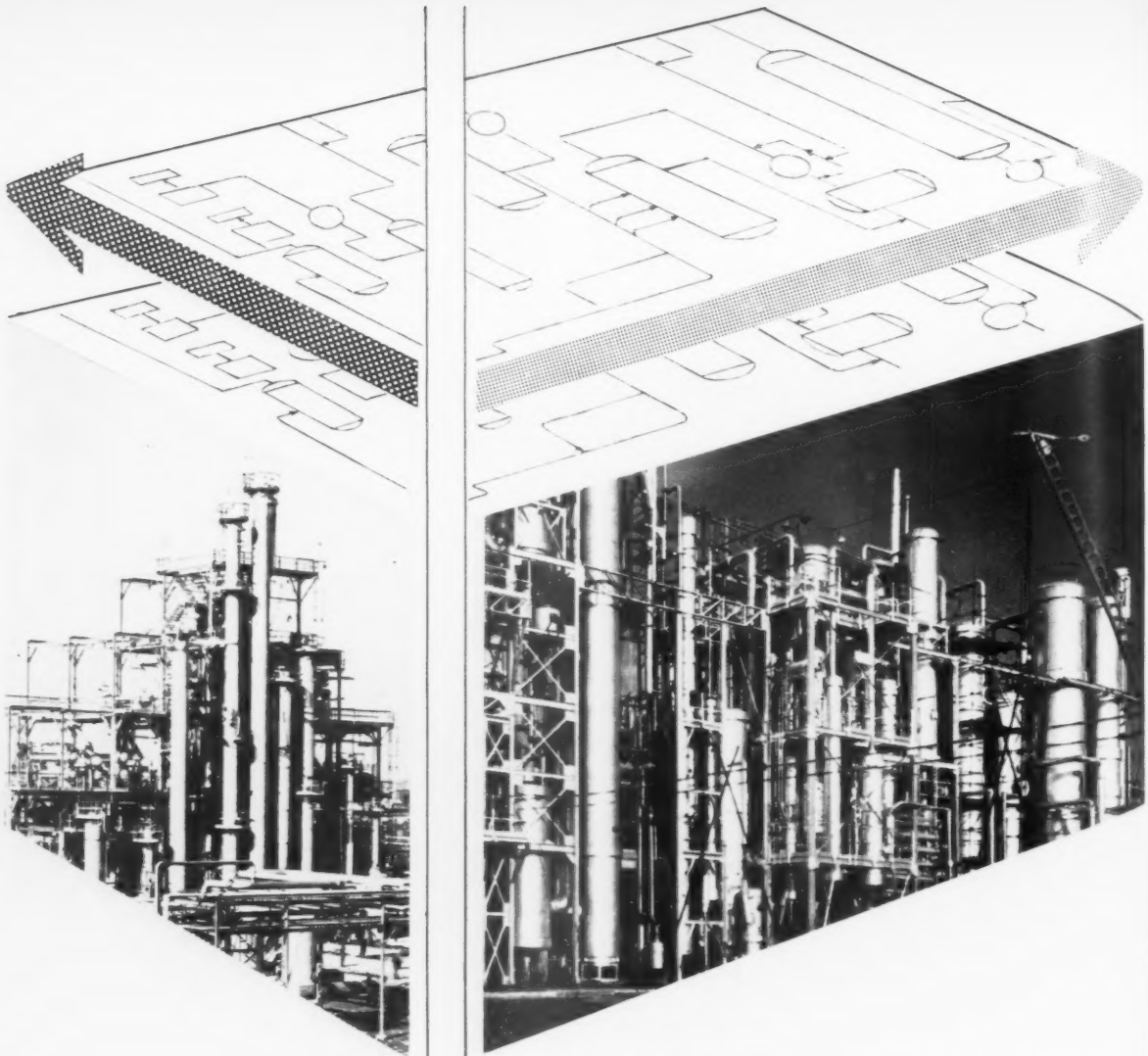

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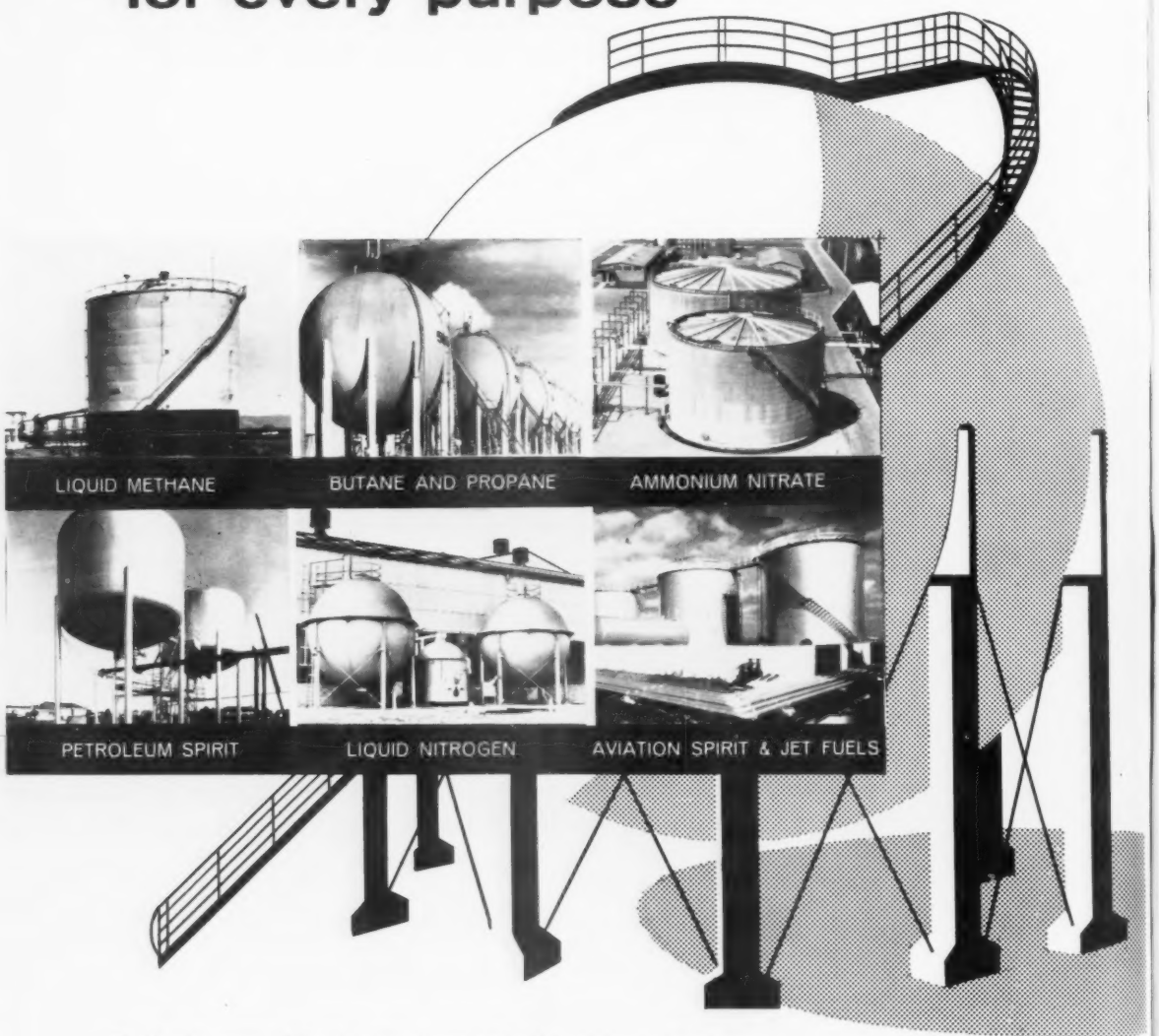

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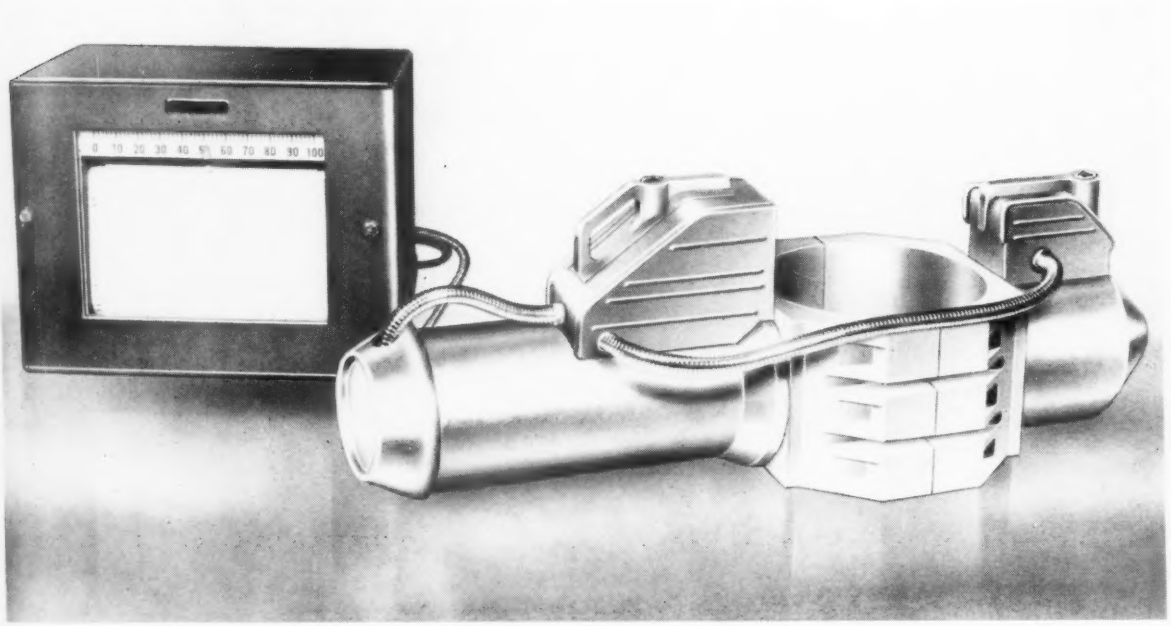

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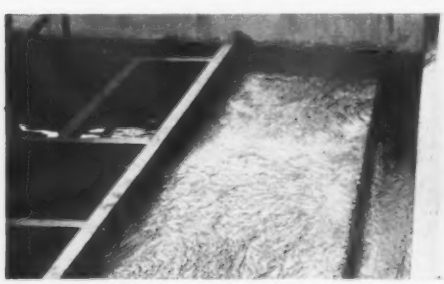

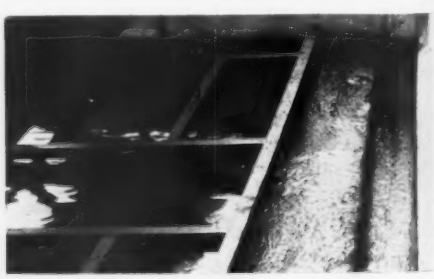

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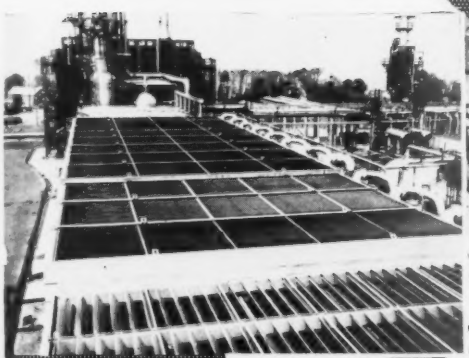

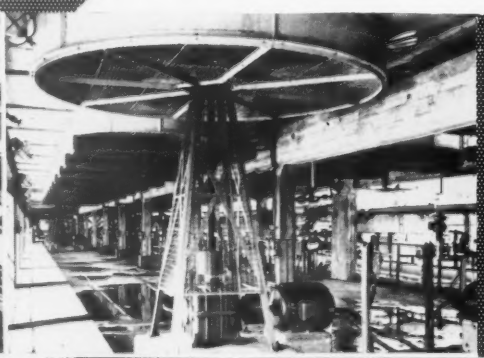

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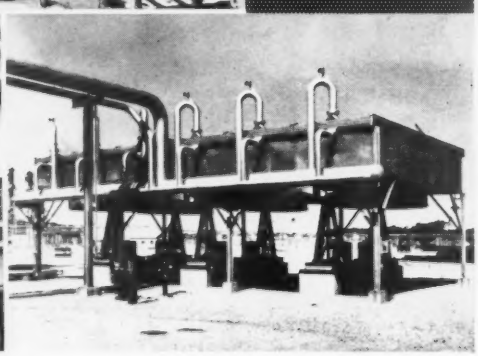

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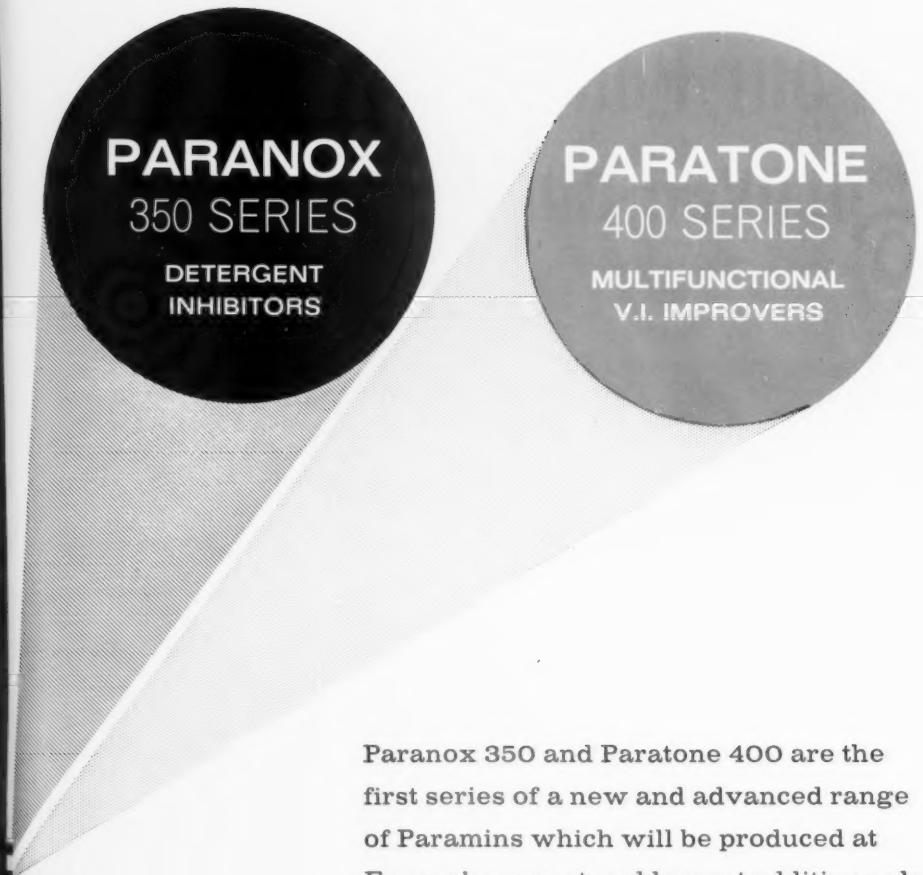

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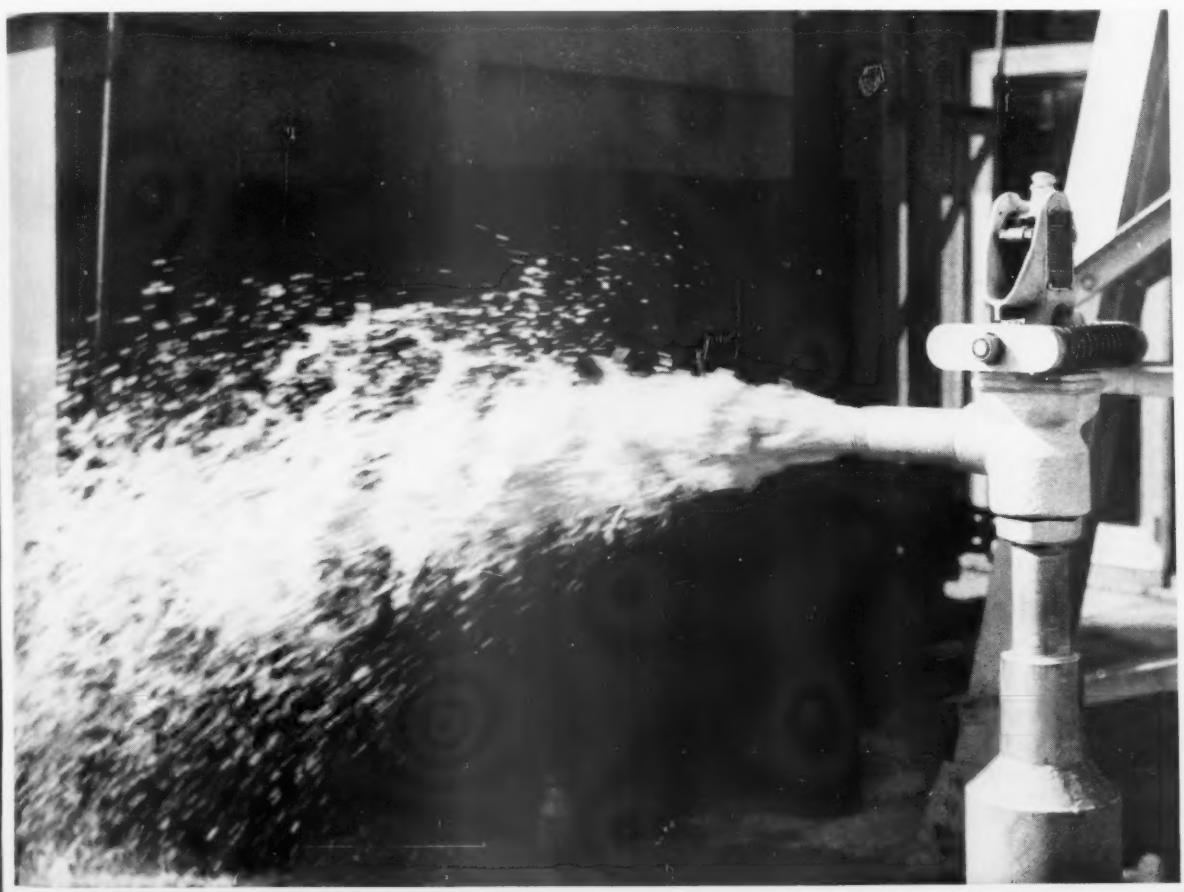

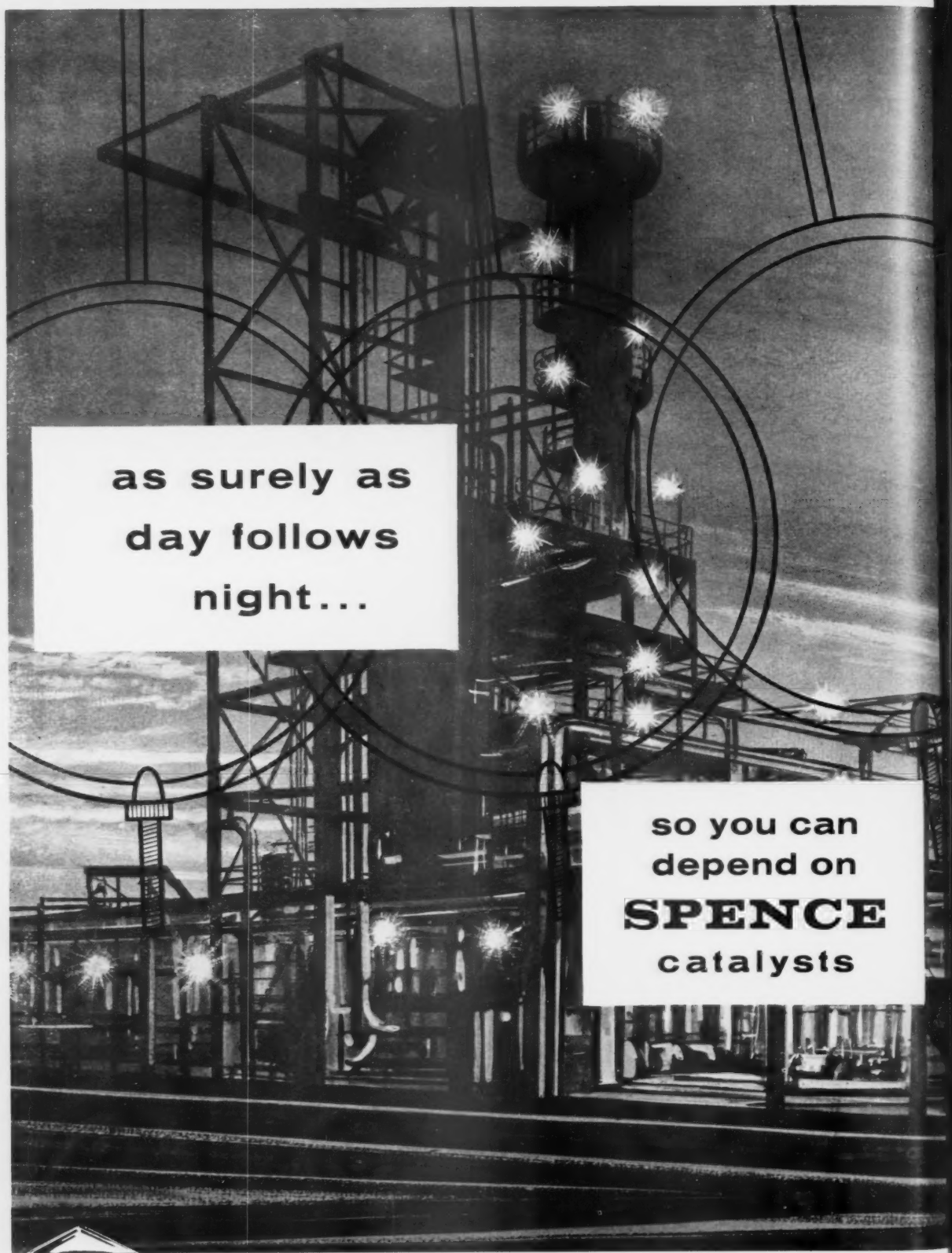

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*Air Pollution—Past, Present, and Future**

By S. R. CRAXFORD†

In all ordinary towns the smoke and sulphur dioxide in the air near ground level arises from the burning of fuels, and even in towns with thriving chemical industries sulphur dioxide from chemical processes affects only a comparatively small area. On a nation-wide scale therefore, a study of the emission of these pollutants into the atmosphere is, in effect, a study of the use of fuels. Emissions from chimneys tend to be dispersed harmlessly into the upper atmosphere by their natural buoyancy, the processes of atmospheric turbulence, and the wind, and the proportion that descends to ground level depends on all these factors, as well as on the height of the chimney concerned.

When considering variations in concentrations of pollutants from one time of day to another, or from one day to another, weather conditions are the controlling factors, but when data are averaged over a year, and one year compared with another, the underlying effects of changes in emissions can be seen although the effects of weather still give rise to major complications. The present paper is an attempt to analyse the data for the last eight years with the hope of being able to apply the results to predict trends in the next few years.

Emission of Smoke and Sulphur Dioxide

The consumption of fuels for each year since 1952 is given in Table I, which shows the amounts of the various fuels burnt by the different classes of consumer, as given in the *Statistical Digest* of the Ministry of Power. The emissions of smoke and sulphur dioxide calculated from these data are given in Table II. Table II is drawn up on the same lines as the table for 1953 in the Report of the Committee on Air Pollution—the Beaver Report (London, HMSO, 1954, Cmd. 9322), but the bases of some of the estimates have been altered to take into account more recent knowledge and changes in conditions. Thus, in the Beaver Report, it was assumed that the weight of smoke emitted from the burning of coal for domestic heating was 2·5 per cent of the weight of coal burnt, while the weight of smoke from industry amounted only to 1·2 per cent of the weight of coal used, except at power stations, where the emission of smoke was assumed to be negligible. In Table II a figure of 3·5 per cent has been used for the weight of smoke emitted from domestic sources following the more recent work of Brown, Hawksley, and Horspool (*J. Inst. Publ. Hlth Engrs*, 1959, **58**, 208). It is generally agreed among those engaged in observing the emissions of smoke from industrial chimneys that an improvement has taken place in the last few years, so that an average value of 1·0 per cent for the weight of smoke emitted as a percentage of the weight of coal burnt in industry has been adopted for 1958 and 1959. The weight of smoke from railway engines has been taken as 2 per cent.

The estimate for sulphur dioxide emission quoted in the Beaver Report was made on the assumption that the average sulphur content of the coals used for all purposes was 1·5 per cent. According to Wandless (*J. Inst. Fuel*, 1959, **32**, 258) there has been a steady rise in sulphur content since that time, and the average figure now stands at 1·6 per cent. This value has therefore been used in calculating emissions of sulphur dioxide from 1957 onwards. The sulphur contents of oil fuels were estimated from data in the possession of the Ministry of Power as follows: gas oil, diesel oil, and derv 0·75 per cent; fuel oil used in electricity works 3·0 per cent; fuel oil burnt by other users 2·6 per cent.

It is considered that 90–95 per cent of the sulphur in coal is evolved as sulphur dioxide when the coal is burnt as

*Based on a paper read at a meeting of the IP London Branch on 21 April 1960.

†Head of the Atmospheric Pollution Research Division, Warren Spring Laboratory, D.S.I.R.

TABLE I

CONSUMPTION OF FUELS IN GREAT BRITAIN FROM 1952 TO 1959

Million tons

	1952	1953	1954	1955	1956	1957	1958	1959
Coal								
Domestic ...	36·8	37·1	38·2	37·1	37·5	35·5	36·2	33·6
Electricity works	35·5	36·7	39·6	42·9	45·6	46·5	46·2	46·0
Railways	13·9	13·4	13·0	12·2	12·1	11·4	10·3	9·5
Industrial, etc. ...	63·9	63·9	65·5	64·5	62·5	59·2	54·6	50·5
Coke ovens ...	25·1	25·9	26·6	27·0	29·3	30·7	27·8	25·7
Gas works ...	27·7	27·1	27·3	27·9	27·8	26·4	24·8	22·5
Coke (excluding gas-works and blast furnaces)	14·7	14·7	15·5	16·0	15·1	13·6	13·4	12·5
Oil								
Gas/diesel ...	1·2	1·3	1·4	1·5	1·8	1·7	2·2	2·5
Derv	1·2	1·3	1·4	1·6	1·8	1·8	2·0	2·3
Fuel oil								
Electricity works	small	small	0·2	0·2	0·4	0·6	2·6	4·1
Other users ...	4·3	4·8	5·7	6·7	7·6	7·7	9·7	11·9

pulverized fuel, whereas only 85–90 per cent is evolved from combustion on mechanical stokers. The emission of sulphur from the industrial burning of coal was therefore calculated on the assumption that 90 per cent of the sulphur is evolved. More sulphur is retained in the ashes of domestic fires than in those of industrial boilers, and a value of 80 per cent emission was used. In the case of oil-firing, it was assumed that 100 per cent of the sulphur is emitted. In estimating the emission from electricity works, allowance was made for gas washing at Battersea and Bankside power stations.

The more important items in Table II are plotted in Figs 1, 2, and 3 to enable trends to be seen at a glance. These diagrams show that there has been a slow but steady decrease in the emission of smoke over the period, the amount in 1959 being about 20 per cent less than the amount in 1952. Fig 2 shows that all the main components of this total smoke emission—domestic, industrial, and railways—decreased steadily, but by far the largest contribution to the total decrease was made in the industrial field. Since 1956 the emission of industrial smoke has decreased by 40 per cent, which is a striking tribute to the Clean Air Act.

The position with regard to sulphur dioxide is rather more complicated. The total emission has risen steadily by about 11 per cent, but the increase appeared to be checked in 1959 when the total was just perceptibly less than in 1958. The major contributions to the overall increase were made by electricity works, both coal- and oil-fired, and by the general and industrial burning of oil. These outweighed the small decreases from railways and the domestic burning of coal, and the notable decrease from coal-fired industrial plant.

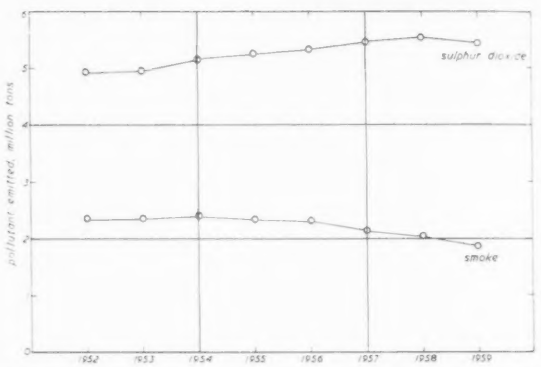

Fig 1 Trends in emission of smoke and sulphur dioxide in Great Britain, 1952–9

TABLE II

EMISSIONS OF SMOKE AND SULPHUR DIOXIDE BY THE MAIN USERS OF FUELS: 1952-1959

Thousand tons

	Smoke								*Sulphur Dioxide*							
	1952	1953	1954	1955	1956	1957	1958	1959	1952	1953	1954	1955	1956	1957	1958	1959
Coal																
Domestic ...	1290	1300	1340	1300	1310	1240	1260	1180	880	890	910	890	900	910	930	860
Electricity works	small	small	small	small	small	small	small	small	960	970	1050	1140	1210	1300	1310	1310
Railways ...	280	270	260	240	240	230	210	190	380	360	350	330	330	330	300	270
Industrial, etc. ...	770	770	790	770	750	650	540	510	1730	1730	1770	1740	1690	1710	1570	1450
Coke ovens ...	small	small	small	small	small	small	small	small	100	100	100	100	100	100	100	100
Gasworks ...	small	small	small	small	small	small	small	small	200	200	200	200	200	200	200	160
Coke (excluding gas-works and blast furnaces) ...	nil	nil	nil	nil	nil	nil	nil	nil	400	400	420	430	410	390	390	360
Oil																
Gas/diesel ...	small	small	small	small	small	small	small	small	20	20	20	20	30	30	30	40
Derv	small	small	small	small	small	small	small	small	20	20	20	20	30	30	30	30
Fuel oil																
Electricity works	small	small	small	small	small	small	small	small	small	small	small	small	20	40	150	240
Other users ...	small	small	small	small	small	small	small	small	220	250	300	350	390	400	510	620
Total ...	2340	2340	2390	2310	2300	2120	2010	1880	4910	4940	5140	5220	5310	5440	5520	5440

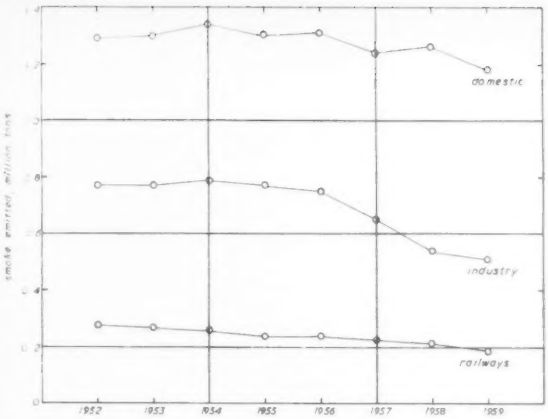

Fig 2 Trends in emission of smoke from the major sources in Great Britain, 1952–9

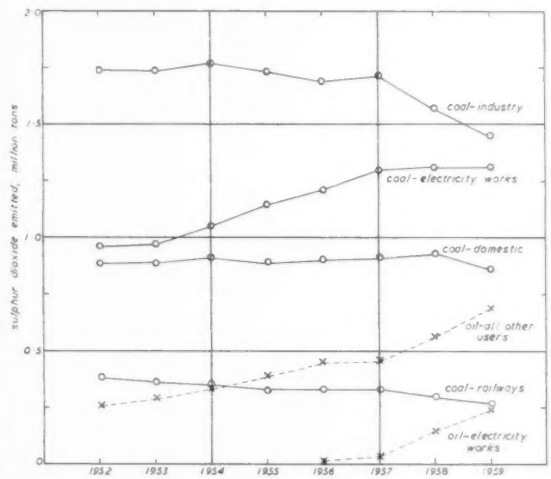

Fig 3 Trends in emission of sulphur dioxide from the major sources in Great Britain, 1952–9

Smoke and Sulphur Dioxide Concentrations in Urban Areas

Daily measurements of concentrations of smoke and sulphur dioxide in the air are made at some 400 sites throughout the country by local authorities and other organizations co-operating with the DSIR. The air is sampled continuously over each 24-hour day, and the sample of known volume is filtered through a white filter paper and then bubbled through a dilute hydrogen peroxide solution. The smoke in the sample is removed by the filter paper and by measurement with a reflectometer its weight is determined from the darkness of the stain produced. The sulphur dioxide is trapped in the hydrogen peroxide where it is oxidized to sulphuric acid, which is determined by titration. Details of the methods are given in "The Measurement of Air Pollution" London, HMSO. The great majority of the sampling sites are in towns or urban areas, not chosen statistically as a representative sample of all the towns in Great Britain, but where local authorities and others were enthusiastic enough to make them. The location of the sites was usually dictated by convenience. Without proper statistically-planned extensions the data obtained are not capable of giving precise information about the average smoke concentrations at different types of site in different types of town, but there are now sufficient sites for yearly average concentrations to be reasonably representative of towns throughout Great Britain.

In attempting to detect trends, it is not sufficient to compare the average smoke concentration at all the sites in operation in any one year, with the average for all the sites in another year. An increase might only mean that in the second year instruments had been brought into use at additional highly-polluted sites. Attention must be restricted to sets of sites at which instruments have been in operation throughout the whole of the period under review, and to enable this to be done the data have been set out in the form shown in Table III. Each of the rows of this Table has been plotted in Fig 4, with the zero of the ordinate adjusted for each to keep the graphs separate. Nothing is lost by this procedure as the individual graphs are not comparable since no two refer to the same set of sites. All the graphs follow the same pattern with peaks in 1955–6 and 1958–9, and a very sharp dip in 1959–60. These changes from one year to the next are clearly not simply a function of changes in emission, but indicate that a major factor in determining the pattern from year to year is the weather which determines the tendency of pollutants to build up near ground level, or to be dispersed harmlessly into the upper atmosphere. However, taking this into account, there is left, as can be seen from Fig 4, a marked downward trend in smoke concentrations, underlying the series of peaks and dips, and this corresponds roughly with the downward trend in emission over the same period.

Trends in sulphur dioxide concentrations have been determined in exactly the same way as those for smoke, using the data obtained by the hydrogen peroxide method already described. The results are given in Table IV and Fig 5 where they are arranged in the same way as the data for smoke in Table III and Fig 4. All the measurements were taken at sites where smoke measurements were also made.

TABLE III

AVERAGE SMOKE CONCENTRATIONS FOR GREAT BRITAIN

(Urban Areas)

No of instruments	*Smoke concentration, micrograms/cu m*							
	1952–3	1953–4	1954–5	1955–6	1956–7	1957–8	1958–9	1959–60
47	204	191	183	206	198	197	199	155
49		189	187	206	198	196	203	159
64			190	208	196	190	202	159
106				233	211	198	208	166
138					211	193	202	158
189						202	207	162
266							209	165

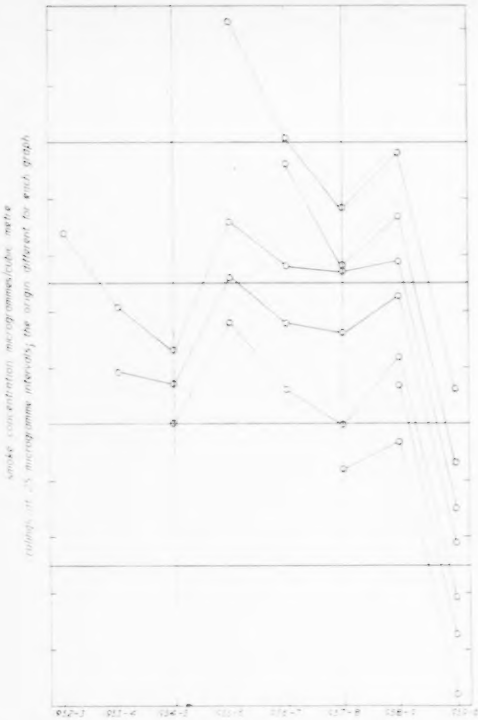

Fig 4 Trends in smoke concentrations in Great Britain

Like Fig 4, Fig 5 shows the effects of changes in weather conditions from one year to the next, superimposed on whatever steady basic trend in pollution there may be as a result of changes in domestic and industrial use of fuels. However, for sulphur dioxide there is no detectable underlying trend, either up or down.

It is reasonable to suppose that the weather will have about the same effect on both smoke and sulphur dioxide, so that if the ratios of the concentrations of these substances are considered, changes from year to year should be independent of weather.

Limiting comparisons to the last four years, for which time there were a reasonably large number of instruments in operation, the data in Table V were obtained.

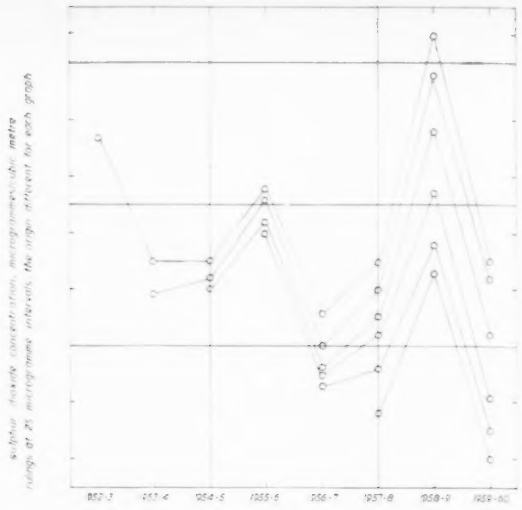

Fig 5 Trends in sulphur dioxide concentrations in Great Britain

TABLE V

THE RATIO SMOKE SULPHUR DIOXIDE 1956–60

	Smoke and SO_2 in the air				*Smoke and SO_2 emitted*
	Smoke	*SO_2*			
	µg cu m (138 sites)	*µg cu m (103 sites)*	*Smoke / SO_2*		*Smoke / SO_2*
1956–7	211	208	1·01	1956	0·43
7–8	193	211	0·91	1957	0·39
8–9	202	233	0·87	1958	0·36
9–60	158	200	0·79	1959	0·34

All the 103 sites at which sulphur dioxide was measured are included in the 138 smoke sites, but, since the two sets are not completely the same, the absolute values of the ratios may be a little in error, although their trend over the period should be entirely reliable. The remarkable feature is that the ratio fell steadily between 1956–7 and 1959–60, and showed no trace of abnormality in 1958–9 when the individual concentrations had peak values. This confirms the view that these apparently erratic variations were due to the effects of changing weather conditions. The steady drop in the ratio smoke/sulphur dioxide is therefore left as the basic trend, and it corresponds very closely indeed with the steady change in the ratio in which these pollutants were emitted over the period.

TABLE IV

AVERAGE SULPHUR DIOXIDE CONCENTRATIONS FOR GREAT BRITAIN

(Urban Areas)

No of instruments	*Sulphur dioxide concentration, micrograms cu m*							
	1952–3	1953–4	1954–5	1955–6	1956–7	1957–8	1958–9	1959–60
28	242	220	220	233	211	220	260	220
29		214	217	231	205	215	253	217
35			225	237	211	220	253	217
75				240	215	222	247	211
103					208	211	233	200
146						208	233	200
219							225	191

Air Pollution in London

Similar calculations have been made for London and the results have been found to differ from the national pattern in a number of informative respects.

Data for the uses of fuels, obtained from the Ministry of Power, and the emission of smoke and sulphur dioxide calculated from them are given in Tables VI and VII, and Figs 6, 7, and 8. These show that the emission of smoke in the London area decreased by about 41 per cent between 1952 and 1959, due mainly to a big drop in domestic coal consumption. The emission of sulphur dioxide increased by 30 per cent during the years 1952 to 1955, but then decreased, the amount emitted in 1959 being only 13 per cent more than in 1952 (there would have been a greater increase if gas washing were not practised at Bankside generating station).

These changes are different from those in the other urban areas throughout the country. The big decrease in smoke

TABLE VI

CONSUMPTION OF FUELS IN LONDON FROM 1952 TO 1959

Million tons

	1952	1953	1954	1955	1956	1957	1958	1959
Coal								
Domestic ...	3·60	3·70	3·64	3·47	3·23	2·63	2·40	2·01
Electricity works	4·10	4·13	4·47	4·79	5·13	4·75	4·50	3·98
Industry	1·26	1·91	1·91	1·92	1·80	1·70	1·68	1·28
Coke								
Domestic ...	0·40	0·50	0·63	0·54	0·51	0·44	0·70	0·48
Oil								
Domestic ...	—	0·03	0·03	0·03	0·05	0·05	0·10	0·13
Electricity works	—	0·04	0·09	0·11	0·10	0·05	0·16	0·33
Industry								
diesel and gas oil	—	0·03	0·03	0·02	0·03	0·03	0·03	0·03
fuel oil	—	0·22	0·23	0·42	0·45	0·46	0·60	0·69
Other users								
fuel oil ...	0·06	0·06	0·08	0·11	0·15	0·17	0·25	0·30

TABLE VII

EMISSION OF SMOKE AND SULPHUR DIOXIDE IN LONDON, 1952 TO 1959

Thousand tons

	Smoke								*Sulphur Dioxide*							
	1952	1953	1954	1955	1956	1957	1958	1959	1952	1953	1954	1955	1956	1957	1958	1959
Coal																
Domestic ...	126	130	127	121	113	92	84	70	86	89	87	83	77	67	62	51
Electricity works	—	—	—	—	—	—	—	—	95	93	107	121	117	122	113	103
Industry ...	15	23	23	23	22	19	17	13	34	52	52	52	48	49	48	37
Coke																
Domestic ...	—	—	—	—	—	—	—	—	10	12	15	13	12	11	18	12
Oil																
All users, fuel oil	—	—	—	—	—	—	—	—	—	13	14	25	37	37	46	51
Total ...	141	153	150	144	135	111	101	83	225	259	275	294	291	286	287	254

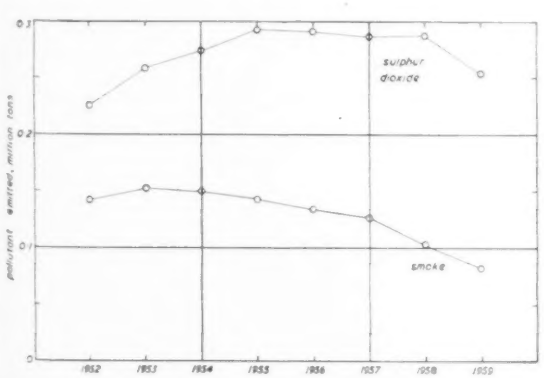

Fig 6 Trends in emission of smoke and sulphur dioxide in London 1952–9

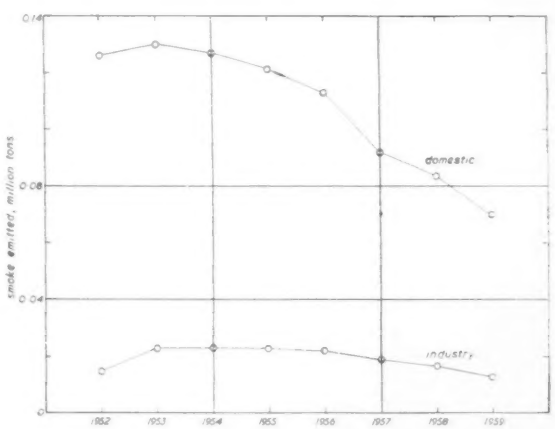

Fig 7 Trends in emission of smoke from the major sources in London 1952–9

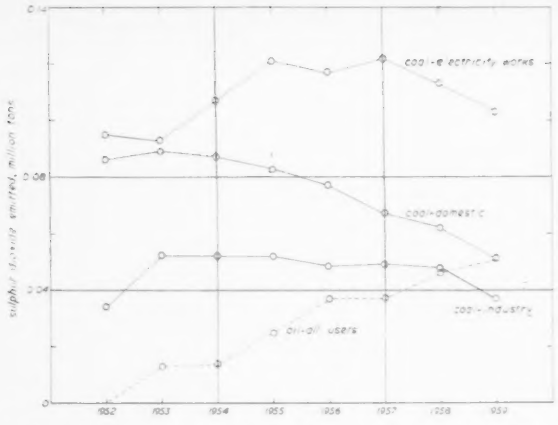

Fig 8 Trends in emission of sulphur dioxide from the major sources in London, 1952–9

emission in London after 1956 was much greater than the average. The sulphur dioxide emission increased more rapidly than elsewhere till 1955 and then decreased, whereas over the urban areas of the country as a whole emission continued to increase until 1958.

It was of particular interest therefore to compare trends of ground-level concentrations in London with those elsewhere, and Tables VIII and IX and Figs 9 and 10 were prepared to correspond to Tables III and IV and Figs 4 and 5. Since, however, only very few instruments were in operation before 1955–6, data for previous years are not included.

As seen in Fig 9, smoke concentrations fell after 1955–6 just as in the average urban area, but in London the fall was so rapid and continued that the unfavourable weather in 1958–9, which caused a sharp peak in pollution for the rest of the country, did no more than slow up the rate of decrease. The weather in London was just as unfavourable as in the rest of the country, and the peak in the concentration of sulphur dioxide was as pronounced as for the average urban area. This spectacular decrease in smoke brought the concentration in London down to the urban average for the country as a whole. It corresponded closely to the decrease in domestic coal consumption in the area and showed what excellent results could be achieved by vigorous smoke-control action.

The position with regard to sulphur dioxide is not so satisfactory. The graphs in Fig 10 show the same peaks at 1955–6 and 1958–9, and the dip for 1959–60 as the country as a whole, due to weather, but no basic trend can be detected. This leaves the concentration of sulphur dioxide in London nearly 20 per cent higher than the urban average for the country. The absence of a significant downward trend is remarkable as the emission of sulphur dioxide decreased by 14 per cent over the period 1955–9.

This result, considered in conjunction with Table VII and Fig 8, can only mean that the fall in emission of sulphur dioxide from the domestic burning of coal is more than offset by the low-level emissions from the sharply increasing use of fuel oil in industry. It again tends to emphasize the

TABLE VIII

AVERAGE SMOKE CONCENTRATIONS IN LONDON

No of instruments	*Smoke concentrations, microgrammes cu m*				
	1955–6	1956–7	1957–8	1958–9	1959–60
32	287	239	222	211	168
50		244	217	213	167
59			214	210	164
62				211	162

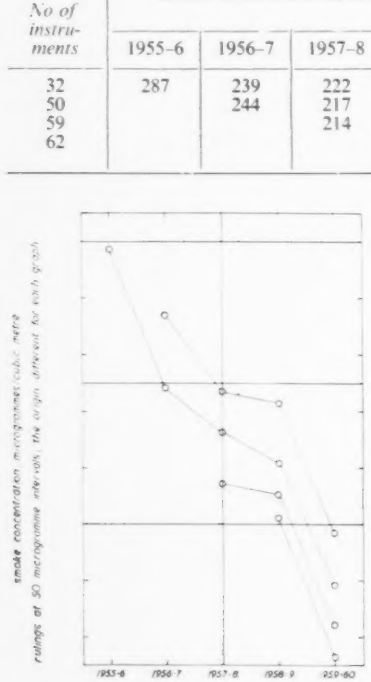

Fig 9 Trends in smoke concentrations in London

TABLE IX

AVERAGE SULPHUR DIOXIDE CONCENTRATIONS IN LONDON

No of instruments	*Sulphur dioxide concentration, microgrammes cu m*				
	1955–6	1956–7	1957–8	1958–9	1959–60
29	288	254	265	291	248
43		245	257	277	237
51			254	274	231
53				265	231

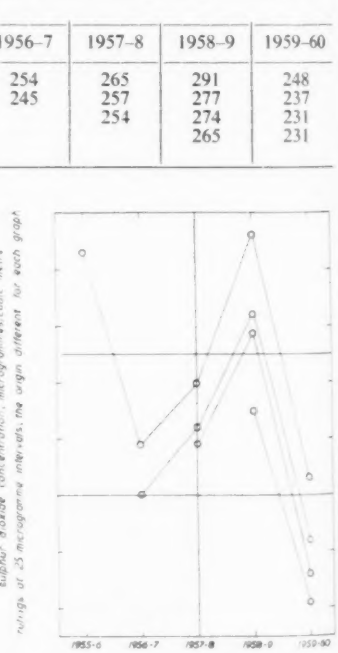

Fig 10 Trends in sulphur dioxide concentrations in London

importance of low-level emissions because over the last three years emissions from electricity generating works have decreased sharply without any corresponding decrease in the concentration of sulphur dioxide near ground level. This is consistent with the view that emissions from high chimneys contribute comparatively little to pollution near the ground.

Conclusions

The main interest in a study of trends is the possibility of using them as a basis of estimates of pollution likely to occur in the near future.

For the country as a whole, the first question to be asked is whether the slow but steady decrease in smoke that has occurred over the past few years is likely to continue. There is good reason to believe that the major source of smoke is the burning of coal for domestic heating (see Williams, F. P., Nat. Soc. Clean Air Conf., 1960), so the question is reduced to one about probable domestic coal consumption. The introduction of smoke control areas under the Clean Air Act, and changing social habits, leading to increasing numbers of houses being left unoccupied and unheated during the day, are resulting in the replacement of coal by gas and electricity, and this, together with increased production of solid smokeless fuels, should enable the improvement to continue. The fact remains, however, that for very many years to come coal must continue to be the main source of domestic heat. This is a consequence of the impossibility of storing electricity and gas from summer to winter and the various technical and economic difficulties of making solid smokeless fuels without obtaining a large amount of gas. It would be quite uneconomic to set up works to meet the winter load and allow them to stand idle during the summer. Taking the whole country into consideration there seems little prospect of greatly accelerating the reduction of smoke in the near future, but the spectacular reductions achieved in London show what can be done by special efforts in particularly affected districts.

Prediction of pollution by sulphur dioxide is rather more difficult. The steady rise in the emission of sulphur dioxide was halted in 1959, but it would not be safe to assume that it has reached its peak. With the estimated expansion of industry for the near future it will be very surprising if the emission of sulphur dioxide does not increase again. However, the fact that pollution by sulphur dioxide near ground level did not increase over a period when the emission was increasing suggests that, if adequate steps are taken to disperse the chimney gases by the use of high chimneys and the suitable siting of works, the concentration of sulphur dioxide near ground level need not increase and might, with careful control, even be expected to decrease slightly. But the data for London presented in this paper should be taken as a warning. Emissions of sulphur dioxide from large coal-burning plant and from domestic heating have been decreasing sharply, but the good effect of this at ground level has been more than outweighed by the increased emission from industrial oil-burning plant and large oil-burning central heating installations. Although, in the last five years, the total emission has decreased, the ground level pollution has not, which suggests that the dispersion from the chimneys of the new oil-burning plant may be inadequate. This is not meant to imply that the change-over from coal to oil is, in itself, responsible for increased pollution by sulphur dioxide, because for the production of a given amount of useful heat there is little if anything to choose between the two fuels as far as emission of sulphur dioxide is concerned.

The data presented indicate that emissions from high chimneys make relatively little contribution to pollution near the ground, which is determined to a large extent by emissions from the lower chimneys, whether domestic, for smoke, or industrial and domestic for sulphur dioxide.

Finally, it should be emphasized that it is only yearly average values of concentrations of pollutants that have been considered in this paper. Concentrations ten times as high, or more, can be observed for periods of a few hours, or a few days, for particularly unfavourable weather conditions, and it is these high concentrations during smog that attract particular attention. As a first approximation, however, it can be assumed that for given meteorological conditions the concentrations of pollutants observed will be proportional to the amounts emitted in the neighbourhood concerned, and that a change in the proportion of high-level to low-level emissions will affect concentrations during a smog in much the same way as it affects yearly average concentrations. In fact, improvements in the yearly average pollution should lead to corresponding improvements in times of smog.

In conclusion, the author would like to thank Dr H. E. Newall, Miss J. D. Carroll, and Mrs B. D. Gooriah, who prepared the data, and Mrs M.-L. P. M. Weatherley to whom he is indebted both for the method of analysis for trends and for its application to the present data.

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SIXTH WORLD PETROLEUM CONGRESS 1963

The British National Committee of the World Petroleum Congress invites contributions of papers to the Sixth World Petroleum Congress to be held at Frankfurt on 19-26 June 1963 under any of the subject sections listed below.

1. Geology and geophysics.
2. Drilling and production.
3. Processing and refining of oil and gas.
4. Preparation of the base stocks from petroleum and natural gas for the chemical industry.
5. Composition, analysis, and testing.
6. Utilization of petroleum products.
7. Engineering, including materials and transportation.
8. Operation, research, statistics, and education.

Those wishing to submit contributions for consideration by the British National Committee are asked to address to the editor the titles of papers they are willing to submit as soon as possible, and preferably by the end of May 1961. The number of British papers which can be submitted to the German organizing committee is limited.

Around the Branches

ABADAN, BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD, YORKSHIRE

Yorkshire Branch

AGM

The Annual General Meeting of the Yorkshire Branch took place at the Great Northern Hotel, Leeds on 8 February under the chairmanship of G. J. C. Vineall. The secretary's and treasurer's reports were placed before the meeting and the committee was elected for the coming year.

Unfortunately, illness prevented the President of the Institute, Julian M. Leonard, from addressing the meeting as planned. However, two films, "Antarctic Crossing" and "Coupe des Alpes", produced by Shell-Mex and B.P. Ltd, were shown.

Stanlow Branch

With C. N. Thompson in the chair, C. F. Port delivered a paper by A. G. Turner on "Liquefied Petroleum Gases—United Kingdom Present and Future Position". Mr Turner was, unfortunately, unable to present the paper himself due to a slipped disk.

The lecture began with a review of the development of liquefied petroleum gases from the time of their introduction in the U.K. in 1934 until the present time when the approximate consumption was 150,000 tons year. This quantity was utilized as follows: 35 per cent, domestic: 5·3 per cent, agricultural: 7·4 per cent, commercial: 17·2 per cent, industrial: and 35·1 per cent, town gas.

Various examples of the industrial uses of the gases in furnaces, where they were used as protective atmospheres in the processing of high nickel alloys and glass, were given, as well as a description of their use in town gas. The agricultural industry was said to be using approximately 6000 tons year for brooders and infra-red work.

Northern Branch

The Yorkshire Lubricating Oil and Grease Trades Association has invited Northern Branch members to join them at Wetherby golf course on 31 May, when it will be holding its annual eighteen-hole medal tournament. There will be a visitors' prize and a prize for novices, who will be able to borrow clubs.

Lunch will be at the Club House at 1 p.m., with play starting at 2.30 p.m. There will be high tea at 6 p.m. Intending competitors should write to E. T. Newsome, T. H. Newsome and Co., Ferrybridge Oil Refinery, Knottingley, Yorkshire stating meals required and name of club or handicap, if any.

Essex Branch

L. E. Glover of Woolwich Polytechnic gave a lecture on "Work Study" to the Essex Branch on 22 February 1961.

He said that there were English books on the subject of work study as long ago as the middle of the 19th century and the basic principles laid down then still applied to-day. But the impact of these theories had been lost in Britain due to opposition by Victorian conservatism. Other countries, however, had taken them up and for the past thirty years had been reintroducing them as products of their own industrial philosophy.

During the lecture, the author discussed aspects of analysis and methods of implementing work study, and drew on his own experience to illustrate each separate step of the analysis.

Referring to human relationships, he used a schematic diagram of the method of applying work study to demonstrate the whole-hearted co-operation needed from management and workers alike to ensure that work study would be successful. He said it was the task of work study personnel to see that proper basic explanations and individual treatments were carried out.

After the lecture a film was shown of a successful work study experiment in the hosiery and garment trade.

1961 Dinner-Dance

The 1961 dinner-dance of the Essex Branch was held on 17 March at the Shell Club, Corringham, when a considerable number of members and their friends assembled for a jolly evening. The chair was taken by E. G. Hannah, chairman of the Branch, who, in the only speech of the evening welcomed Mr and Mrs George Sell. He said that George was retiring from the editorship of the Institute publications at the end of March after having been associated with the Institute since its foundation. He wished them a happy retirement.

London Branch

The London Branch held their annual luncheon at Chatham Rooms, London on 22 March. Dr T. F. Gaskell, chief physicist to the British Petroleum Company, and a well-known oceanographer, was the guest of honour and after the luncheon gave a short and interesting talk on the problems associated with the probing of the earth's crust in the endeavour to ascertain the composition of the mantle surrounding the core of the earth. It was known that the mantle contained radioactive matter which gave off heat and this might explain the periodic variations in geological activity that have taken place in the past.

First, and in passing, he mentioned a study which had been made on the meteorites which had been falling on the earth as long as historical records had been kept. A recent examination of one of these meteorites had shown a hydrocarbon content similar

Scenes from the Essex Branch Dinner Dance

Photographs by R. Grant

on one hand to that of butter and on the other to that of recent marine sediments.

From this had been drawn the conclusion that living matter had existed at the place of origin of the meteorite. Dr Gaskell suggested that more scientific study was needed.

Some four years ago a meeting of scientists in Toronto agreed that it would be desirable to bore down to the Mohorovicic discontinuity, or Moho for short. The Moho is the dividing line between the thin (5–20 miles) earth's crust and the mantle. The latter is about 2000 miles thick and surrounds the core of the earth at about 2000 miles from the centre.

Referring to the proposals to drill a borehole into the Moho, he said that the pioneer of Moho boring was Conan Doyle's Professor Challenger. He chose the hard way and dug a mine shaft 8½ miles deep and discovered a jelly-like substance.

Oceanographic work had shown that the Moho was thinner under the ocean than on land and that it might be as little as 3 or 4 miles below the surface of the sea.

In the oil industry, said Dr Gaskell, wells had been drilled to depths of about 5 miles and improvement in equipment and techniques should make depths of ten miles possible within the foreseeable future. Meanwhile, the United States had started on a hole which, it was hoped, would reach a depth of 3 to 4 miles. Its location was at a place where the water was about 3 miles deep and special techniques were adopted to keep the drilling barge on site. The object of the preliminary trials was to drill as far as possible into the sediments without the necessity of changing bits. In order to bore deeply through hard rocks, it might be necessary to anchor a string of casing firmly from the water surface to the bottom in order to make bit-changing and re-entry to the borehole possible.

Dr Gaskell concluded by suggesting that the smaller countries of the Middle East, who had gained so much wealth from oil, might support the drilling of wells into the Moho.

Pictures which Confirm the Success of the London Branch Annual Luncheon

★ ★ ★

INSTRUCTIONS TO AUTHORS

Much time and labour can be saved by editors, and by authors for that matter, if the latter has full information on the requirements of the journal or publication to which he is offering a contribution. With this view in mind the Publications Committee of the Institute has prepared a booklet setting out the principles to be followed by authors.

In addition, data are presented regarding presentation of papers at meetings, and a special article on the preparation and use of visual aids by lecturers gives valuable information on a subject so often overlooked by authors.

Copies of this booklet can be obtained on application to the Institute.

RECORD YEAR FOR THE ELECTRICAL INDUSTRY

The electrical and allied industry enjoyed a record year in 1960–61. Output rose by 7 per cent to reach a total value exceeding £1600 million. Exports were also at their highest ever level, being worth over £293 million.

These preliminary figures are contained in the Fiftieth Annual Report of The British Electrical and Allied Manufacturers' Association 1960–61, which also states that the industry's research bill is currently running at the rate of £64 million a year.

With the exception of domestic goods, which were affected by changes in credit control, nearly all the major sectors of the industry either maintained or increased their output. In particular, the capacity of turbo-generating plant delivered reached a new high record of 5146 mW, of which 36 per cent went overseas.

Advances in the design of power generating plant are said to be resulting not only in improved efficiency, but also in lower capital costs. New 550 mW sets, which will have a thermal efficiency of 36 per cent and are due for delivery in 1963, will cost only £40 per kW of plant installed compared with an estimated £50 per kW in 1960.

The report is critical of cuts in the government programmes for railway electrification and nuclear power in which, it says, the industry has invested heavily. More than £15 million is said to have been spent on specialized facilities for railway electrification in recent years, and it is estimated that research and development account for about 30 per cent of all nuclear energy costs.

BEAMA co-operated in the preparation of thirty-six new British Standards during the year, and assisted with revisions or addenda to a further nineteen. Its educational projects included a guarantee by member companies to meet half the cost for the first seven years of the new Readership in Electric Traction Engineering at the Imperial College of Science and Technology.

* * *

MIDDLE EAST OIL PRODUCTION

	February	*Jan-Feb*
	Tons	
Iraq Petroleum Co. Ltd ...	2,758,155	5,954,492
Basrah Petroleum Co. Ltd ...	773,192	1,681,341
Mosul Petroleum Co. Ltd ...	96,608	209,385
Qatar Petroleum Co. Ltd ...	630,033	1,341,267
Iraanse Aardolie Exploratie en Productie Mij	4,335,000	8,941,000
	Barrels	
Arabian American Oil Co. ...	43,321,239	87,857,788
Bahrain Petroleum Co. Ltd ...	1,260,569	2,658,630
Getty Oil Co. and American Independent Oil Co. (Kuwait-Saudi Arabia Neutral Zone)	4,256,664	8,762,192

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for February was 1,088,000 tons, the total for 1 January to 28 February being 2,524,000 tons.

Crude processed at Aramco's Ras Tanura refinery during February was 7,220,597 brl, the total for 1 January to 28 February being 14,057,215 brl.

ASTM COMMITTEE D-2 MEETING

Thirty-two of the ASTM's main technical committees met during Committee Week, 30 January to 3 February, in Cincinnati. Over 1200 engineers and scientists working in 360 committee sessions made progress in developing new material standards as well as bringing current ASTM standards up to date.

A six-day meeting of Committee D-2 of the ASTM, and its various technical committees and research divisions, was also held in Philadelphia in February and a record attendance was reported. The highlight of the meeting was a formal symposium on "Current Research on Motor Gasoline Which May Affect Future Specifications". There were ten papers presented at three separate sessions and the lively discussion was evidence of the wide interest in this subject.

The Symposium on "Contamination of Hydraulic Fluids" comprised four papers on the following subjects: "Solid Particulate Matter in Hydraulic Fluids: Measurement Requirements and Methods", "ISO-Kinetic Fluid Sampling", "The Fine-Particle Bank", "The Contamination Control of Dust Controlled Rooms".

Following the symposium there was a panel session sponsored by Section I on Aerospace Applications of Technical Committee "N" on Hydraulic Fluids. At this session there was presented a "Proposed Microscopic Method for the Determination of Sub-Sieve Particulate Matter in Hydraulic Fluids for Aerospace Applications". In this method particles are counted by using a membrane used to entrap the particulate matter on its surface, and are sized and statistically counted by microscopic means. Information on design requirements for clean rooms pertaining to fabrication, process, assembly, test, and inspection of precision components and assemblies for hydraulically operated mechanisms was presented.

Of particular significance for new specifications was the completion of a specification for liquefied petroleum gas. The specification represents a real step forward in the establishment of detailed requirements for this material now widely used for domestic heating and many industrial applications. A new method of test was also developed for determining volatility of liquefied petroleum gases. Of special significance was a decision to subdivide the work of the present technical committee on lubricants. This will now be divided into two separate technical committees, one to deal with automotive, and the other to deal with industrial lubricants.

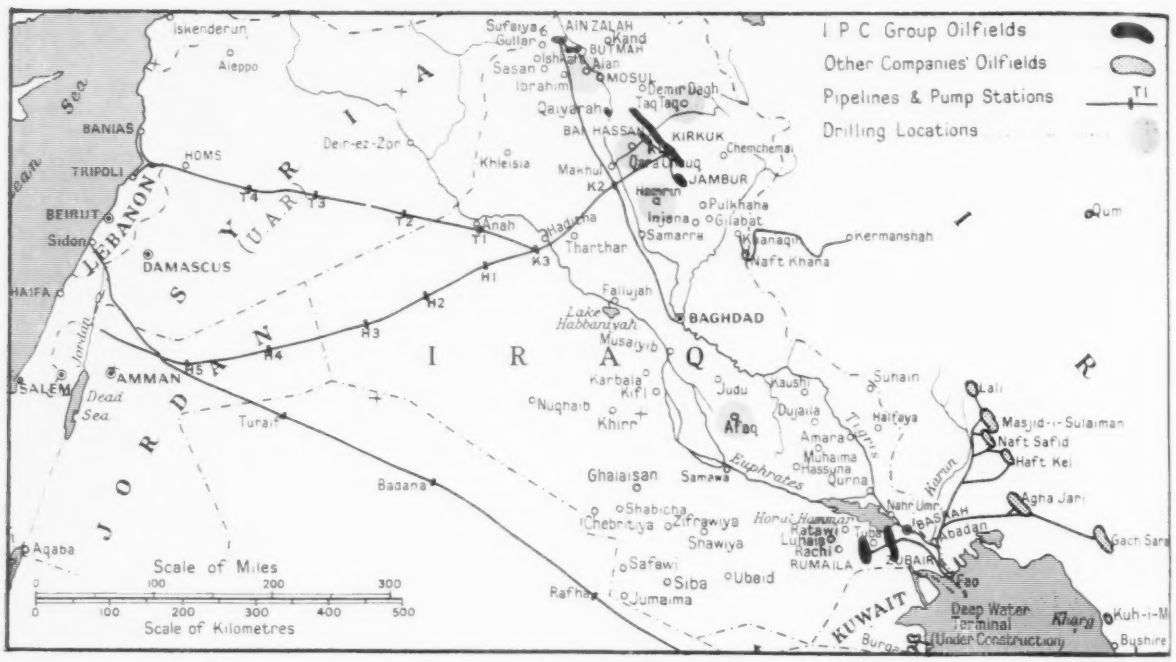
Arrangements were made to join with the National Lubricating Grease Institute in sponsoring a Symposium on the Effect of Oil Viscosity on Grease. This will be held at the NLGI Annual Meeting in Houston, Texas, later this year. The effect of water and fluid contaminates on greases is under study.

The Research Division on Elemental Analysis announced plans for a Symposium on Rapid Methods of Elemental Analysis Used in the Petroleum Industry, which is to be held at its February 1962 meeting.

Important changes were made in the method of test for tetraethyl lead in gasoline (D 526), including the addition of a new section on precision and procedures for analysing tetraethyl lead.

The next meeting of Committee D-2 will be held at the 1961 Annual Meeting of the Society the week of 25 June in Atlantic City, N.J.

IPC Group Operations in 1960



Total production of the Iraq, Basrah, and Mosul Petroleum Companies for the year 1960 rose to 46,534,398 long tons, an increase of 5,636,722 tons compared with the previous year.

Production rates increased from an average 900,780 bd in January to 1,038,297 bd in October.

In June Iraq Petroleum Company's Bai Hassan field began production. A twenty-mile 12-in pipeline links the new producing field with K.1 pumping station near Kirkuk. In September, Kirkuk, Bai Hassan, and Jambur were producing at a combined average rate of 37·03 million tons a year.

The combined production rate from Basrah Petroleum Company's Rumaila and Zubair fields in September averaged 12·12 million tons a year, and at Mosul Petroleum Company's Ain Zalah and Butmah fields the rate was 1·29 million tons year.

Comparative production figures for 1959 and 1960 are as follows:

	1959	1960
	Long tons	
IPC (Kirkuk, Jambur, Bai Hassan) ...	27,330,109	33,841,608
BPC (Rumaila, Zubair)	12,297,162	11,396,379
MPC (Ain Zalah, Butmah)	1,270,405	1,296,411
Total ...	40,897,676	46,534,398

Exploratory Drilling

IPC

Pulkhana 6, south-east of Kirkuk, was abandoned as a dry hole in March after reaching 4985 ft. Gilabat 2, also south-east of Kirkuk, had reached 5,162 ft in July when operations were suspended. West of Kirkuk, Qara Chauq 1 was drilling at 8535 ft at the end of December. Demir Dagh 1 was spudded-in during March but was abandoned at 8755 ft in September. In the latter month deepening operations began at Chemchemal 2, which had reached 7407 ft in 1953 and was then suspended. Taq Taq 1 was spudded-in during December and was drilling at 475 ft at the end of the year.

BPC

In May Tuba 1, between the Rumaila and Zubair fields, was abandoned at 11,940 ft, and Kifl 1, in the northern part of the Concession area, was abandoned in July at 10,684 ft. The well at Shawiya 1 was abandoned in April at 5860 ft. Dujaila 1 was spudded-in during May and was drilling at 13,394 ft at the end of the year.

Dujaila became the deepest well ever to have been drilled in Iraq, beating the previous record held by Rachi 1 (also a BPC well) which was drilled to 12,959 ft in 1956–7. Wells at Ubaib 1, Ghalaisan 1, and Safawi 1 were also abandoned at over 6000 ft depths. In September Afaq 1 was spudded-in and was drilling at 10,433 ft at the end of the year.

MPC

Drilling continued at Samarra 1 until May when the well was abandoned at 11,511 ft. Alan 2 was spudded-in during June and was drilling at 8677 ft at the end of the year.

WELLS COMPLETED IN IRAQ—1960

	Oil	Gas	Dry	Total footage
Exploration:				
IPC	1	—	3	49,550*
MPC	—	—	1	11,511*
BPC	—	—	5	35,127
	1	—	9	96,188
Development:				
IPC	9	—	1	35,234
MPC	3	—	—	29,139
BPC	8	—	—	96,676
	20	—	1	161,049

*Includes deepening operations.

NUMBER OF WELLS AT 31.12.60

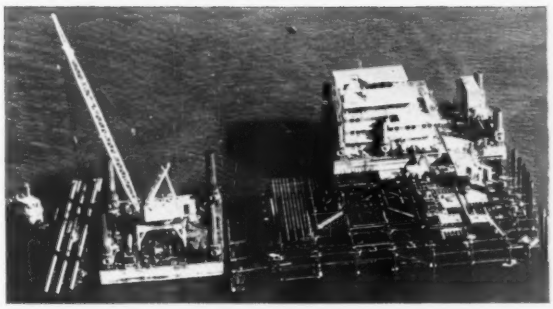
	Flowing	Pumping	Producer wells shut-in	Producers total
IPC Kirkuk ...	44	—	21	65
Bai Hassan	6	—	2	8
Jambur ...	2	—	2	4
BPC Rumaila ...	13	—	14	27
Zubair ...	26	—	11	37
MPC Ain Zalah	5	—	1	6
Butmah ...	—	1	5	6

Construction

As a result of the completion of looplines paralleling the 555-mile Kirkuk to Banias pipeline throughput in northern Iraq was increased in 1960 from a rate of 30·2 million tons/year in January to 37·6 million tons/year in October.

Work started in 1957 and by April 1960, 306 miles of new line had been completed, crossing Syria from the Iraq border to Banias terminal. In the following month a 38-mile section of new line was completed from a point near Homs in Syria to Tripoli terminal in Lebanon. In the meantime work had started on the construction of 249 miles of new loops in Iraq, between K.1 (Kirkuk) and the Syrian border, and most of the work now remaining to be completed is between K.3 and T.1. The pipeline is mostly 30-in and 32-in in diameter, but 24-in pipe was used over a distance of 89 miles towards Banias. For 28 miles the 24-in loop lies parallel with the new 30-in line to Tripoli.

Murban 3 where several promising oil shows have been reported



Work continued throughout the year on the construction of the deep water terminal in the Arabian Gulf.

To pump the increased throughput down the mainline when the new extension is completed means the modernization of existing pumping stations. To achieve this end the Company has ordered new plant for four pumping stations: K.1, K.3, T.2, and T.4. In the case of K.1 and K.3 the existing stations will each be supplemented by two Clark Brothers 302 gas turbines, rated at 6000 hp at 115°F. Orders were placed for the manufacture of these in the U.K. by the Hawker Siddeley Group Ltd. The turbines will drive Mather & Platt crude oil pumps running at 3000 rev/min and operating on a parallel pumping duty.

Similarly, T.2 and T.4 pumping stations will each be equipped with five Westinghouse W82M gas turbines, again with a rating of 6000 hp at 115°F. Three of these were built in the United States, the remainder will be made under licence by NV Motorenfabriek Thomassen of De Steeg, Holland. They are arranged for direct drive to centrifugal crude oil pumps operating at 5000 rev/min.

The orders for pumps at T.2 and T.4 were shared: contracts were placed with Mather & Platt for five and with the Royal Dutch Engine Works of Helmond, Holland, for another five.

The gas turbines will operate on natural gas from the Kirkuk field. A possible later development will be the planning of further improvements to pumping facilities at two other mainline stations—T.1 and T.3. The pumping stations at T.2 and T.4 will be instrumented to allow for remote control of these stations from a master control room at T.3.

In the Basrah area, one stage towards the plan to increase productive capacity in southern Iraq from 12 million to 22 million tons/year was completed on 22 September when Turriff-Burden Ltd (contractors for Basrah Petroleum Company) finished laying a 64-mile 30–32-in pipeline between Zubair and Fao. Construction of the new line began in July 1960; it follows the route of the 24-in line which was commissioned in 1954. With the completion of the new oil line the original 12–16-in pipeline (completed in 1951) has been freed from oil duties, and at the end of the year it was being realigned and converted to a Company gas line and used to supply gas from Rumaila to Fao. This gas will be utilized in combustion turbines in connexion with the new deep water terminal there.

Petroleum Development (Trucial Coast)

Murban 3 was drilling at the beginning of the year and in April several interesting shows of oil were reported below

8400 ft. Testing to evaluate these shows has continued on the Murban structure for most of the year and, in the meantime, Murban 4 and 5 have been spudded-in. Total footage of the two exploration oil wells drilled in 1960 was 18,886 ft.

Qatar Petroleum Company

Production from Dukhan field has been running at approximately 8 million tons year (161,528 average bd in November). Total production for the year was 8,083,032 tons, compared with 7,866,650 tons for the same period in 1959.

One producing well was completed in Dukhan at 7344 ft. In May an exploration well, Fuwairat 1, was spudded-in in the north-east part of the peninsula, but was abandoned at 7000 ft in September. There were no wells drilling at the end of the year.

Petroleum Development (Oman)

In February the exploration well at Haima was abandoned after reaching 11,504 ft. In the same month Afar 1 was spudded-in but this well, the fourth to be drilled by the Company, was abandoned at 4749 ft in April. The Company now no longer forms a part of the IPC group.

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Lectures, Courses, and Conferences

Integrated Data Processing

The one-day conference on Integrated Data Processing in Britain and America, which was held in February, is being repeated on 24 May at Church House, Westminster. Tickets are £6 6s each and can be obtained from the British Productivity Council, Vintry House, Queen Street Place, London, E.C.4.

Laboratory Equipment Exhibition

This year's Laboratory Apparatus and Materials Exhibition will be held at the Royal Horticultural Society's New Hall, London, from 19–22 June.

A special feature of the exhibition is a series of 12 lectures on recent advances in laboratory techniques. Subjects will include: Radio-Frequency Methods in Analytical Chemistry, Vapour Phase Chromatography, The Biological Assay of Insecticides, and The Electron Microscope in Studies of Protein Synthesis.

Both British and overseas equipment will be on show at the exhibition.

BEAMA Export Conference

The British Electrical & Allied Manufacturers' Association is arranging a two-day export conference at the Connaught Rooms on 5 and 6 October 1961. It will be opened by the President of the Board of Trade, The Rt. Hon. Reginald Maudling, MP.

Sulphur Problems in Boilers

A paper on the subject of "Sulphur Problems in Boiler Operation" was presented to the Institution of Hospital Engineers, Swansea, by H. N. Wigan, M.C., M.Inst.Pet., director of Combustion Chemicals Ltd, recently.

The paper included opinions on the subject from authoritative sources such as oil companies, the CEGB, and boiler manufacturers. The author commented on boiler efficiency and explained the application of his company's range of liquid fuel treatments.

Reprints of the paper may be obtained from Combustion Chemicals Ltd, Elcot House, 33 Dorset Square, London, N.W.1.

Physics of the Electron Microscope

The Annual Conference of the Electron Miscroscopy Group of The Institute of Physics and The Physical Society will be held from 10–14 July 1961 at the University of Nottingham. It will be concerned mainly with the physics of the electron microscope and its applications.

Information can be obtained from the Administration Assistant, The Institute of Physics and The Physical Society, 47 Belgrave Square, London, S.W.1.

Symposium on Inorganic Polymers

A Symposium on Inorganic Polymers is to be held at Nottingham University from 18–21 July, 1961. It will consist of nine main lectures and a larger number of shorter contributed papers.

Details are available from the general secretary of The Chemical Society at Burlington House, London, W.1.

Welding Technology

A full-time post-graduate course in welding technology will be held at The College of Aeronautics, starting on 9 October. The Diploma in Advanced Engineering will be awarded on completion of the course.

A prospectus is available from the warden of the College, at Cranfield, Bletchley, Bucks.

Effluent and Water Treatment

The Second Effluent and Water Treatment Exhibition and Convention will be held at the Seymour Hall, London, W.1., from 31 October–3 November 1961. It will be larger and more comprehensive than the previous exhibition and the convention will include papers from overseas experts.

International Congress on Combustion Engines

The Sixth International Congress on Combustion Engines will be held in Copenhagen from 18–23 June 1962. The theme of the Congress will be "Recent Developments with Diesel Engines and Gas Turbines above 3000 hp per Engine and with Gas Engines above 1500 hp per Engine".

Details are available from the British National Committee of the Congress at 6 Grafton Street, London, W.1.

GEORGE SELL'S RETIREMENT LUNCHEON

On 9 March George Sell's colleagues on Publications Committee and its Sub-Committees entertained him to lunch on the occasion of his retirement. Dr Evans, who was in the chair, spoke of the guest of honour's long period of service to the Institute which went back for many years to the first years of its existence. Many of George Sell's friends and associates of many years—several being members of the "old boys club"—stood up to echo the chairman's tribute to his never failing help and constant cheerfulness to all in the development of IP publications, and with his invaluable work on standardization and library matters.

The president paid tribute to Mr Sell's work over the years

The President, although admitting he was not one of the "old boys club" himself, paid tribute to the assistance he had received and to Mr Sell's work on building the IP publications to their present eminence.

Old friends and colleagues—E. W. Noble, J. S. Parker, D. L. Samuel, E. Thornton, D. A. Hough, Dr E. B. Evans, . . .

The "retiring" editor being presented with a portable typewriter

Mr Sell, in reply recalled memories of the early work on publications and standardization and spoke feelingly of the happy years he had spent, expressing his warmest thanks for the co-operation he had received from his colleagues throughout the years. He said he was sure that his successor would receive the same willing co-operation.

The editorial team

In conclusion Dr Evans, on behalf of the Committee and its Sub-Committees, presented George Sell with a handsome portable typewriter which would no doubt be in constant use in his new consultancy role, and wished him very many happy years in what would obviously be an exceedingly active "retirement".

. . . W. H. Thomas, J. H. Parkinson, Dr W. E. J. Broom, and G. A. Dickins

Branch of the Month Feature

South-Eastern Branch

Barges, Bugs, and Barrels

The South-Eastern Branch covers the counties of Kent, Surrey, and Sussex. However, like a film star's bikini, it covers some parts more completely than others. Thus of the total area of about 3700 square miles, its activities are chiefly concentrated in the 80 or so square miles along the estuaries of the Thames and Medway.

Industry in this area has a history going back long before the Industrial Revolution. The Romans made cement on the banks of the Medway and Thames, the guns that broke the Armada were cast in the village foundries of the Kent and Sussex weald, and the origins of the tourist industry may be traced to the hoteliers who grew fat on the pilgrims journeying to Becket's tomb in Canterbury Cathedral. Centuries later, the aircraft industry started when Shorts built a flying machine for the Wright Brothers on the Isle of Sheppey, and by the start of the first world war had established a seaplane works at Rochester. In the nineteen twenties and thirties this factory built flying boats for Imperial Airways, and during the last war produced large numbers of Sunderlands for escort duties with the Atlantic convoys. As we shall see, the Medway has been connected with the oil industry longer than most places in England.

It is geography, however, that has been of the greatest importance in the development of the area. This has always been the "Gateway to England", and the strength and vitality of the country has always been closely linked to the strength and efficiency of its gate. While the Roman Count of the Saxon Shore kept his castles at Richborough, Dover, and Pevensey, the barbarians were held at bay, but with the passing of Rome these counties became a battlefield, and Britons, Angles, Saxons, Jutes, Danes, Normans, and French plundered and pillaged here for 800 years. As an example of this, the Anglo-Saxon Chronicle relates that after the Battle of Benfleet King Alfred's forces massacred the retreating Danes and nailed their skins to the great doors of Rochester Cathedral and Minster Church in Sheppey. As the central government became more firmly established in London, however, more thought was given to the security of the coasts, and the Cinque Ports were given their extensive privileges in return for the ships that kept our shores inviolate.

King Alfred is usually regarded as the founder of the British Navy, but it was not until the time of the Tudors that the King's ships played much part in the defence of Britain. It was then, too, that a Royal dockyard was built at Chatham and the Medway became a base for ships of the Royal Navy. Francis Drake was nine years old when his father came to Chatham as scripture-reader to the fleet and Vicar of Upchurch. Devon-born he may have been, but he learnt to sail on the crowded waters of the Medway, where the yachts now ride at anchor. His seamanship was taught him on the hoys trading to Flemish ports, where he first received "the Pope's blessing", a raking broadside reserved by the Spaniards for the subjects of Elizabeth I.

It was during the following century that Britain and the British Navy suffered their greatest humiliation. Charles II, unable to meet the expense of a Navy as well as Nell Gwyn, laid up the fleet at Chatham in the middle of a war with the Dutch. In June 1667, Admiral de Ruyter sailed up the Medway and burnt or captured the warships lying there. The forts along the river were in no better shape than the fleet they were to defend—the guns of one fired a round at the Dutch and then fell off their worm-eaten mountings. However, under the impetus of Samuel Pepys, the Navy and the dockyard recovered and grew in strength and importance. The Navy is no longer based on Chatham but the Naval dockyard continues in active operation; the Navy's newest submarine was launched last December from a slip a few hundred yards from the spot where Nelson's *Victory* entered the water in 1765.

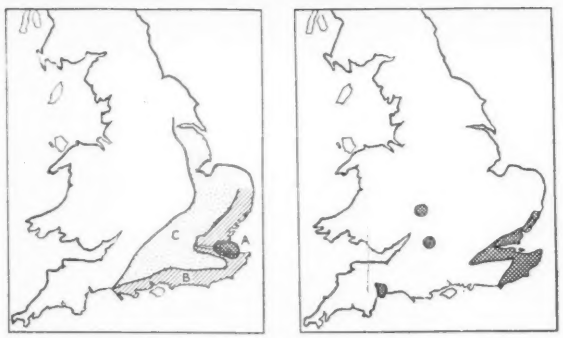
Sirdar *is one of the few surviving Thames sailing barges. The photograph shows her in her working rig*

Courtesy of London and Rochester Trading Co

One of the most distinctive features of the Thames and Medway estuaries was the spritsail-rigged barges which used to ply the rivers and creeks with every conceivable type of cargo. Only three of these barges still trade under sail, and they are really kept by their owners for their prestige value. Some of the barges have been converted to barge-yachts which continue to operate under sail. Others are moored without rigging as houseboats, but most of the survivors have been converted to diesel power and still use these waters, without their huge rust-coloured sails. The annual Thames and Medway barge races, started in the 1860's, are still features of the life of these rivers, but now only about a score of barges and barge-yachts compete where previously hundreds raced each year. However, a lament for the passing of sail can only be due to sentiment, and

is in any case somewhat out of place in a petroleum journal.

The estuarine marshes of North Kent have another, rather macabre, claim to fame as being the site of the last malaria epidemic in Britain. Until the end of the nineteenth century, malaria was endemic in these parts, and it was always said that no young husband from the marshes need worry if he fell out of love with his bride. Provided she came from outside the district, she would be dead within a year anyway! By about 1900, however, the draining of the marshes and the cleaning of ditches and creeks had combined with improved living standards in reducing the disease, although it did not disappear altogether, as the cause of malaria was not properly understood until about that time, and control measures could not be introduced until after the first world war. In 1916, too, a camp was built on the Isle of Sheppey for troops sent home from Salonika with malaria, and by the end of 1918 half the population of Grain, just across the Medway, had contracted the disease. Cases of malaria in Kent accounted for over 80 per cent of the whole epidemic of those years. Since then, vigorous measures have been taken to eradicate the disease, so successfully that when the Kent Oil Refinery was being built at Grain there were no outbreaks of malaria in the district, in spite of the arrival there of large numbers of construction workers.



Maps by courtesy of Dr W. D. L. Smith and *The Lancet*

Left: Areas with conditions favouring transmission of malaria. A, 69 per cent of the cases after the Great War; B, 23 per cent; C, 5 per cent; Rest 3 per cent. Right: Distribution of indigenous malaria, 1941–1948

The rural parts of South-East England are noted for two characteristic features: hop gardens and orchards. An old rhyme had it that "Hops and heresy, baize and beer, Came to England all in a year". Baize is outside the area and scope of this article and, in this age of tolerance, heresy is really only a burning issue in Moscow and Madrid. Hops and beer, however, are still going strong in these counties. Machines are more and more replacing cockneys as hop-pickers, and oil has replaced charcoal for heating the oast houses, which are no longer attached to every farm. Old oast-houses are much sought-after nowadays for conversion into homes for fashionable people trying to be different from other fashionable people, so these conical buildings are still very common. Brewing, too, is becoming less of an art and more of a science, with large modern breweries replacing the older, smaller, ones. The arrival of oil early in this century, and more particularly, the opening of the first refinery, gave a new meaning to the word "barrel", which to the people of the Medway at least no longer refers only to old and mild.

The *Petroleum Review* reported in February 1907 that the Admiralty was so gratified by the success of their experiments with liquid fuel that another extensive fuel oil storage depot would be constructed. It was to be built at Grain, on the Medway, with a storage capacity of 20,000 tons of fuel oil, and would be able to bunker the largest warships at any state of the tide. As the Navy changed to liquid fuel so its requirements of fuel oil increased and the bunkering depots at its major bases grew in size and scope.

In 1923, an American, Mr de Ganahl, bought some 130 acres of the Grain marshes and began the construction of a petroleum storage installation. At about the same time he erected two Cross cracking units at the site, together with a boiler house and other ancillary plant. Feedstock for the refinery was Russian kerosine supplied at the rate of 50,000 tons year until 1927, when the yearly rate was increased to 300,000 tons. Marketing of the products from this refinery was through the Power Petroleum Company, which Mr de Ganahl had bought at the start of his enterprise. Soon after the completion of the cracking units, a silica gel plant was commissioned to treat the cracked light distillate. However, the silica gel oxidized diolefins in the feed and the whole thing "gummed-up". The refinery restarted a short while later with a better treatment scheme, and the silica gel episode delayed but did not stop the onward march of oil. Presumably, too, the affair provided useful experience, so was not entirely wasted! In 1925 a pipe-still was erected and the Company started marketing white spirits, obtained by the distillation of Russian kerosine. Mr de Ganahl sold the undertaking before leaving England, and in 1932 refining operations ceased. The process units and run-down tankage were dismantled and the boilers and generating equipment sold. All that remained at Grain were the storage tanks, still in use by the Medway Oil and Storage Company as a distribution depot, and the Admiralty tanks already mentioned. Extension to the Medway Oil and Storage Company's installation continued after the closing of the refinery, and in 1939 construction began on 22 buried tanks a short distance from the main tank farm to increase still further the capacity of the installation.

Meanwhile, further up the Medway, at Kingsnorth, Berry Wiggins and Company had built a refinery which came on stream in June 1930. This company had already been operating for nearly ten years, initially supplying high-class electrical insulating compounds. Shortly afterwards the firm began the manufacture of moulding compositions and bitumen road dressings and surfacing materials. Berry Wiggins were pioneers in the use of bitumen for road construction, and as early as 1927 the Company's Liquaphalt binders were used to make the first bitumen carpet, laid on a trunk road in Warwickshire. The Kingsnorth refinery was, therefore, designed primarily for bitumen production, although, of course, the full range of petroleum products has always been obtained from the crude oil processed. The Company operates a comprehensive marketing and distribution service based on its refineries at Kingsnorth and Weaste, on the Manchester Ship Canal, and on bulk installations in Scotland and northern England. The Kingsnorth refinery was thus one link in an already well-established supply network, and has grown in size and complexity as the parent company has diversified its operations. Crude oil, chiefly from Venezuela, is brought in by sea, and finished products sent out by road, rail, and water. Bee Ness Jetty, the ocean terminal, is notable for being the longest pier in England, with a length of one and three quarter miles, and was

designed by the Company's civil engineering staff.

Further big petroleum developments in the area started in 1947 when British Petroleum (then the Anglo-Iranian Oil Company) began planning a 2 million tons year refinery on the Isle of Grain adjacent to both the Medway Oil and Storage Company's installation and the Admiralty fuel oil depot. The site was attractive because of the presence of a long stretch of deep water a few hundred feet from the high tide line, and because the land was of little use for agriculture. Work on the marshes started in 1950 and the following year it was decided to increase the refinery capacity to 4 million tons year, with 140,000 tons year of lubricating oils. The refinery was commissioned in 1953 and since then capacity has been increased to 9 million tons year. All these developments have been fully reported in the *IP Review*, and it is sufficient here to say that the refinery possesses atmospheric and vacuum distillation units, catalytic cracking and reforming facilities, a thermal reformer, an alkylation unit for aviation spirit manufacture and SO_2 extraction, sulphur production and hydrofining plants, in addition to sweetening units and a power station. Lubricating oils are produced in a string consisting of propane de-asphalting, furfural extraction, MEK dewaxing, and clay treatment units. Work is now in hand on a 23,000 bsd catalytic reformer and, in conjunction with the California Chemical Corporation, on a plant for the production of xylenes. The refinery also provides feedstocks for the adjoining works of the South-Eastern Gas Board, where petroleum products are converted into town gas. This is one of the largest gas works in the Board's area with an output of 20 million cu ft day, which will be more than trebled when the current expansion schemes are completed.

Courtesy of Medway Oil & Storage Co. Ltd

Mr de Ganahl's refinery on the Grain marshes in 1925. *The rundown tanks can be seen mid-foreground with the refinery units beyond them. The four stack boiler house and workshops are at the rear, and office and residential accommodation is situated to the right of the plant*

Although the oil industry is fairly long-established in the south-east of England, the South-Eastern Branch of the IP was founded only in November 1951. Since then the Branch has grown in numbers, and extended its activities to meet the requirements of the large membership from engineering firms in the area. Among these firms are the Fisher Governor Company and Woodfield Rochester Ltd, making, respectively, control valves and drilling equipment, and providing a diversity of interest among the Branch members much wider than would be obtained solely from oil refinery staff.

Such, then, is the pattern of the South-Eastern Branch's area. It has great historic associations—the pharos at Dover was built in 60 AD, and some of our "Tudor-bethan" mansions date back to George V's reign—and it is also in the van of modern developments with the construction of a vast nuclear power station at Dungeness. The future of the area will be determined by the rate at which the "great wen" of London festers outwards, turning the lovely country of Kent and Surrey into the back-garden of England. Of the subjects of our heading, the barges are a nostalgic reminder of a wind-powered past, the "bugs" still sting, but no longer give us malaria, and the barrels are becoming of ever greater importance as the petroleum and allied industries expand.

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A GLOSSARY OF PETROLEUM TERMS

The third edition of the Institute's publication *A Glossary of Petroleum Terms* has now been published and is a complete revision and a very considerable expansion of its 1955 predecessor.

Containing definitions of 460 terms, the scope has been widened to cover the whole of the industry from drilling and production to marketing and standardization. The definitions are designed to be of the greatest possible value to the non-technical reader who needs to ascertain the general meaning of the industry's technical terms and jargon. It has not been found possible, or even desirable, to include every conceivable term but endeavour has been made to cover the more important special terms encountered in the petroleum industry.

Useful additions in this edition are first an appendix on "Petroleum Terms in U.K. Legislation". Many definitions of petroleum products are scattered through the statutes, etc., and a useful purpose has been performed by bringing these together. A second appendix lists recommended abbreviations of the titles of some official bodies which are associated in petroleum and its utilization.

This booklet of 40 pages is available from the IP offices, price 5*s* post free.

Personal Notes

Lord Godber

The Rt Hon. Lord Godber of Mayfield, F.Inst.Pet., who has been chairman of The "Shell" Transport and Trading Co. Ltd since 1946, is retiring at the end of June. Lord Godber has been a member of the board of the Company since 1928 and a managing director since 1935. In 1957 he was awarded the Cadman Memorial Medal by the Institute of Petroleum.

He will be succeeded as chairman of the Company by **F. J. Stephens,** M.Inst.Pet., who has been a member of the board since 1951 and a managing director since 1957. Mr Stephens is also a managing director of the Royal Dutch Shell Group of Companies, a position which, in accordance with the usual practice, he will relinquish when he takes up his new appointment.

F. J. Stephens

H. Wilkinson, C.M.G., a managing director of the Royal Dutch/Shell Group of Companies, who has been a member of the board of The "Shell" Transport and Trading Co. Ltd since 1949, has been appointed a managing director of the Company in succession to Mr Stephens.

D. H. Barran

D. H. Barran will replace Mr Stephens as a managing director of the Royal Dutch Shell Group of companies. Mr Barran is at present president of Asiatic Petroleum Corporation in New York, and his new appointment means that he will become a member of the board of The "Shell" Transport and Trading Co. Ltd, and a principal director of Bataafse Petroleum Maatschappij N.V.

T. M. Forgan, A.M.Inst.Pet., has been appointed managing director of Kuwait Shell Petroleum Development Co. Ltd.

Mr Forgan began his career with Shell in 1933. Two years later he went to the United States where, with the exception of the war years, he remained until 1948. Since then his assignments have included assistant general manager of United British Oilfields in Trinidad, assistant general manager to the Iranian Oil Refining Company in Abadan, and assistant to the president of Compania Shell de Venezuela.

T. M. Forgan

E. F. Choppen

E. F. Choppen, M.I.P., M.Inst.Pet., has rejoined the board of directors of Esso Petroleum Co. Ltd after completing a year's assignment with Standard Oil Company (New Jersey) in New York. Mr Choppen, who joined the Company 31 years ago as a chemist, subsequently held a wide range of positions, mainly on the marketing side, before being appointed to the Board in 1959.

L. B. Johnson has also been appointed a director of Esso Petroleum Co. Ltd. He has been European financial representative for Jersey Standard in London since 1957. He joined the Company as foreign exchange analyst in 1946, subsequently serving as exchange manager before becoming assistant treasurer in 1954.

Professor **F. H. Garner,** O.B.E., who retired from the Chair of Chemical Engineering at the University of Birmingham at the end of September, has been awarded the Imperial Medal (Fourth Class) of Iran "for outstanding services to the Iranian nation in the field of educating the numerous Iranian students at Birmingham."

George M. Parker

George M. Parker, president and a director of Esso Export Corporation, has been appointed senior representative of Standard Oil Company (New Jersey) in London and Jersey shareholder representative for its affiliate companies in Scandinavia. Mr Parker has been president of Esso Export since 1954. In his new post, he will succeed **Paul J. Anderson,** M.Inst.Pet., who has been nominated for election to the board of directors of Standard Oil Company (New Jersey).

Robert H. Milbrath has been elected president and chairman of the executive committee of Esso Export Corporation in succession to Mr Parker.

Poor health has caused **Stewart P. Coleman,** a vice-president and member of the board of directors of Standard Oil Company (New Jersey), to retire.

Mr Coleman started in the oil business with Humble Oil & Refining Company as a chemical engineer after his graduation from Rice Institute in 1920. After advanced study at Massachusetts Institute of Technology, where he received his master's degree and doctorate, Mr Coleman headed Humble's technical services and development work.

He joined the parent company, Jersey Standard, in 1933 and later became the first manager of its Co-ordination and Economics Department. He was elected a director in 1946, a vice-president in 1955.

J. A. V. Watson

L. G. Packham

C. E. R. Millidge

A. A. Barr

Castrol's New Assistant Managing Directors

William F. List, M.Inst.Pet., who last year completed fifty years service with the Castrol Group, is retiring from his position as assistant managing director of Castrol Ltd at the end of the year. He will, however, remain on the Board of the Company.

Following Mr List's retirement, four new assistant managing directors will be appointed on 1 January 1962. They are:

J. A. V. Watson, O.B.E., who joined Castrol in 1929, becoming publicity manager a short while afterwards. He held this position until he was appointed general manager, Motor and Aviation Sales, in 1948. He became a director in 1952.

L. G. Packham, M.Inst.Pet., who joined Castrol in 1925 as a clerk in the Motor Department. He was appointed manager of the Overseas Branches Department in 1943 and overseas general manager in 1951. He was elected to the Board of Castrol Ltd in 1955.

William F. List

C. E. R. Millidge, who joined Castrol in 1918. He became assistant manager of the Motor Department shortly after the last war, and, two years later, manager. In 1952, he was appointed manager of the Castrol Division, and was elected to the Board in 1957.

A. A. Barr who joined Castrol thirty-three years ago as a junior in the publicity department. In 1938 he became assistant publicity manager becoming manager in 1948. In 1955 he was made group publicity manager and was appointed a director in 1957.

J. P. Wijsman and **R. J. Woodward** have been appointed directors of Shell Trinidad following the retirement of **W. J. de Vries** and **A. L. Brown.**

R. B. Hoffman and **C. D. Read** have been appointed vice-presidents of the Gulf Eastern Company.

They will continue to be resident in London where Mr Hoffman will continue to be responsible for co-ordination of marketing activities and Mr Read for co-ordination of refining activities of Gulf companies in the Eastern Hemisphere.

R. B. Hoffman

C. D. Read

N. R. Griffiths has been appointed manager of the newly formed Distribution Department of Petrofina (Gt Britain) Ltd, dealing with road and rail transport. **G. W. Cooper** has been appointed assistant manager of the Company's Scottish region, in Glasgow. **J. D. Frame** has been appointed assistant manager (Operations) of the Scottish region.

E. Duer Reeves, a director and vice-president of Humble Oil and Refining Company, Houston; **Fred A. L. Holloway,** a vice-president of Humble; and **Loren F. Kahle,** transportation co-ordinator of Standard Oil Company (New Jersey) have been elected to the board of directors of Esso Research and Engineering Company.

H. de Grey-Warter, O.B.E., T.D., M.I.P.R., has joined Alenco Ltd as group advertising and publicity manager. He has had a long career in the fields of advertising, sales promotion, and public relations, and was formerly public relations manager of Regent Oil Co. Ltd.

H. de Grey-Warter

Notes of the Month

BP Acquires Production Facilities in United States

The British Petroleum Co. Ltd has acquired all the issued shares of Kern Oil California Ltd, and so for the first time has its own production facilities in the U.S.A.

The shares were purchased from the Rio Tinto Co. Ltd's subsidiary, Kern Oil Co. Ltd. Under the same transaction BP also acquired Kern Trinidad Oilfields Ltd, who have sizeable crude output, and are at present engaged in offshore drilling in the Gulf of Paria, and St Helens Petroleum Corporation, together with Kern's shareholding in Devon-Palmer Oils Ltd. The latter company holds acreage in Canada and the U.SA.

Kern Oil California Ltd owns the freehold rights to 4930 acres in California and leasehold rights to a further 3688 acres in the same state. It also has 1993 acres leasehold in Louisiana. The Company's production during the first six months of 1960 was 512,686 brl.

BP has previously had access to United States crude through an agreement made with Sinclair Oil Corporation in October 1958, and also owns leases in Alaska, through BP Exploration (Alaska) Inc, where survey work is being carried out. It is also associated with Sinclair Oil Corporation and Richfield Oil Corporation in test drilling and exploration in the Gulf of Alaska. This is the first time, however, that the Company has had its own producing wells in the United States.

The transaction involved the transfer of three million new £1 BP ordinary shares. Under the terms of the agreement, Kern Oil Company is understood to be retaining an interest in the undeveloped exploration properties of the companies involved and certain clauses provide for further payments to be made in respect of reserves proved on properties in Wyoming during the next three years.

OEEC Directive on Energy Policy

A recommendation designed to help member countries in framing energy policy in the light of their own national interests while taking into account the needs and possibilities of the OEEC area as a whole, has been adopted by the OEEC Council. Long-term energy policy, it says, should be based on the assumption that there will not be any lasting shortage of energy supplies in Western Europe before 1975.

Indigenous energy resources should be developed or encouraged only where they can be exploited in sound economic conditions. Governments are urged to permit the application of a more flexible price policy for coal, and to encourage better methods of marketing energy. It considers that the greatest importance should be attached to the transformation of coal into secondary forms of energy.

To prevent distortions in the energy market, the recommendation states that as far as practicable, fiscal policy should be designed in such a way that taxes, charges, and customs duties, as well as transport costs, do not lead to the preference of a less economical for a more economical form of energy. Bodies controlled by public authorities, it suggests, should normally make sufficient provision in their prices for return on capital.

Coal-producing countries are asked to encourage the concentration of production in mines where prospects for productivity and cost are favourable, and to ensure that any action taken to overcome the technical and social difficulties of the coal industry does the least possible damage to the structure and economic development of the supply and use of energy as a whole.

The member countries have been asked to report to the OEEC by the beginning of April 1962 on the action they have taken to implement the recommendation.

Good Progress at Das Island

Good progress is being made by Abu Dhabi Marine Areas Ltd in its preparation for the first phase of commercial production from its under-water Umm Shaif Oilfield 60 miles off the Trucial Coast in the Arabian Gulf. The Company is owned two-thirds by BP, and one-third by Compagnie Française des Pétroles.

The Umm Shaif field is about twenty miles east of Das Island, which is now being developed as the operating centre and exporting terminal of the oilfield, and the two will be linked by an 18-in submarine pipeline. The main pipeline will start from a collecting platform near the centre of the field to which each producing well will be linked by a 6-in or 8-in diameter submarine pipeline.

The main pipeline will terminate at the gas oil separators on Das Island. The crude will then pass through flow tanks to the main crude storage tanks. From the storage tanks the crude will be pumped to the offshore tanker loading berth through a 26 28-in diameter pipeline. Both the crude loading pumps and the new electric generating equipment will be driven by gas turbines operating on gas from the separators.

The existing artificial harbour is being extended to provide shelter for the new mooring tugs, and construction of the tanker loading berth has begun.

Burmah Oil Company's Activities in U.S.A.

In just over a year's operations in the U.S.A., Burmah Oil Western Company participated in drilling fourteen offshore wells with a total footage of 138,783 ft. Of these, five wells were completed as potential producers.

The Burmah Oil Western Company is linked for joint operations in the offshore areas of Texas and Louisiana with the Murphy Corporation of Eldorado, whose associate, Ocean Drilling and Exploration Company, is the operator. The Burmah Oil Company is also linked with the Murphy Corporation in Canada, through Burmah Oil Company of Canada Ltd, and in the Gulf of Papua, together with Camelot Nominees, through Burmah Oil Company of Australia.

Exploration in Canada is being carried out in three areas in the Mackenzie District of the Northwest Territories. Burmah Oil Company of Australia was incorporated at the end of January 1961, and the area in which it has a joint interest covers 9500 sq m of the Gulf of Papua.

More Exploration Licences in West Pakistan

The Government of Pakistan recently issued exploration licences covering the Sanghar and Khisar desert areas of West Pakistan. Within a week of the award of its licence, Pakistan Petroleum Ltd had moved a fully equipped gravity survey party into the area, which is situated to the South of Nawabshah.

"Bayanihan" which means "team work," is a common practice among the people of the Philippines. Here a group of them are moving a building from the site of the new refinery being built at Tabangao, Batangas, south of Manila, for The Shell Refinery Co. (Philippines) Inc. The refinery will come on stream at the end of 1962 *with a capacity of* $1\frac{1}{4}$ *million tons/year*

BP Exploration in Libya

The latest news of BP's oil search activity in Libya is that BP Exploration Co. (Libya) Ltd is drilling a second test well in the Tripolitania province of Libya which, at the time of writing, had reached 6400 ft. Further east, in northern Cyrenaica, a deep test well was down to 7700 ft. In southern Cyrenaica a second well which proved to be dry, was completed recently at a depth of 9694 ft.

BP is also drilling in another concession area in southern Cyrenaica in which it holds a 50 per cent interest, and in which it expects to drill up to six wells. The first had reached 7400 ft.

In addition to drilling crews, the Company has six seismic survey parties at work in Libya.

SIRIP's First Shipment of Offshore Crude

The tanker *Corte Maggiore* sailed from the Persian Gulf recently with the first consignment of crude oil from SIRIP's offshore well No. 1. The 18,000 tons of crude in the shipment had been flowed during testing, which was still going on. A second well being drilled from the same platform reached 7047 ft before fishing operations were needed.

IPAC is reported to be testing offshore wells A-1 and B-1 at final depths of 13,151 ft and 12,497 ft. Other news of drilling activity in Iran is that NIOC is drilling one well at Alborz, another at Sari, and two at Sarajeh; and at Sequta, in the Zagros agreement area, SIRIP is side-tracking a well at 7815 ft.

IOEPC is reported to have abandoned Suru No 1 at Bandar Abbas at 14,895 ft, and moved the rig to Sheik Shoeib Island where Lavan No 1 was due to be spudded-in at the beginning of May.

Test Well at Dasori

A joint test well spudded-in on 15 December by Pakistan Petroleum Ltd and Sun Oil Company at Dasori in West Pakistan had reached 10,192 ft in rocks of the Lower Cretaceous age at the end of February. No gas or oil shows had been encountered at that time, and it was planned to continue drilling to Jurassic age rocks or reservoir rocks, whichever was encountered first.

Progress at Karachuk

Crude deposits in the government run field at Karachuk in Syria are officially estimated to be 2 million tons. Seven of the nine wells drilled so far have proved productive, and there are hopes that the other two will eventually produce at the rate of 500 tons/day and 170 tons/day.

A tenth well is due to be sunk, and the eventual output of the field is expected to reach 2 million tons.

Survey Work on Nigeria's First Refinery

Survey work for the proposed BP-Shell refinery in the Port Harcourt area of Nigeria has started. Soundings have been made of the Bonny River Bed, and soil tests have been carried out to find a possible route through nearby mangrove swamps for a pipeline to connect the refinery with a new tanker jetty which is to be built.

The refinery is to be constructed by The BP-Shell Petroleum Refining Company of Nigeria Ltd. It will have a capacity of one million tons of Nigerian crude oil a year, and come on stream in 1963 or 1964.

Aden Refinery Expansion

The British Petroleum Company Ltd is to spend £550,000 to increase the processing capacity of BP's Aden Refinery from its present annual capacity of 5·5 million tons to 6·8 million tons. This will be achieved by modification and minor additions to existing units, re-allocation of tankage, and modifications and additions to pipeline systems. The work is already under way and should be completed by the end of the year.

An installation for the export in bulk of liquid petroleum gas by tanker is also nearing completion. It comprises two hortonspheres, each capable of holding 250 tons of LPG, together with the necessary pumping and jetty facilities. The LPG has previously been exported in small containers from an adjacent installation.

Light Oil Feedstock for Hydrogen Plant

The new hydrogen-making plant which is being installed at ICI's Billingham factory at a cost of over £6 million will use light oil as a raw material in place of coke.

Installation of the new process, designed by the Billingham Division, will take two years. The factory's coke ovens, now using 600,000 tons of coking coal annually, will close at the end of the year, and, until the new plant becomes operational, coke will be purchased from the National Coal Board.

The process requires a smaller labour force than the current method, and the Company hopes that it will result in reduced prices for its nitrogen products.

World's First Refrigerated LPG Tanker

The world's first large-scale refrigerated LPG tanker is now under construction in Japan and should be ready to make its first voyage early in 1962. The owners, the Bridgestone Liquefied Petroleum Gas Co. Ltd, say they will use it to carry LPG purchased from BP in Kuwait to Japan where it will be distributed as bottled gas.

The vessel will carry 180,000 barrels, or about 17,000 tons, of refrigerated LPG at —40°F, and have a service speed of 16 knots. It was designed by Conch International Methane Ltd in which Canadian Shell, Continental Oil, and Union Stock Yard and Transit Co. of Chicago are shareholders. The same company was responsible for the design of the *Methane Pioneer* which carried 12 trial cargoes of methane from the U.S. Gulf Coast to Canvey Island, Essex, in 1959 and 1960.

Much of the experience gained with the *Methane Pioneer* is being incorporated in the new tanker, which is being built by Mitsubishi Nippon Heavy Industries (Yokohama) Ltd.

Pin Pointing Causes of Engine Failure

A simple method for measuring the operating temperatures of engine parts such as valves and pistons has been developed by "Shell" Research Ltd at the Thornton Research Centre. It depends on the fact that when certain alloys are heated and then cooled, their original hardness is changed.

Measuring hardness changes in a sectioned alloy piston

In most cases the new technique makes it possible to determine with accuracy the maximum temperature reached in the range of 100°C to 1000°C by comparing the original hardness of an engine component with its hardness after running. When the metal of a component is not suitable to record maximum temperature in this way the change in hardness of small inserts of a suitable alloy are measured.

Britain's 37,000 Motor Spirit Retailers

There are nearly 37,000 retail sites selling motor spirit in the United Kingdom. This figure was given by F. W. J. Scott in a speech to the annual conference of the Motor Agents Association recently.

Mr Scott is general manager of retail sales for Shell-Mex and B.P. Ltd, and this is the first occasion for some time that figures of this nature have become available from such an authoritative source. Previously they have been a matter of speculation rather than fact, and the most reliable estimates have usually put the figure at between 35,000 and 36,000.

Mr Scott said that in 1938 there were just over 35,000 retail outlets for motor spirit and since then the total had increased by 1654. In the same period the number of cars had trebled and motor spirit sales had risen from under 3 million tons to over 6 million tons. Looking to the future, he said that although sales were expected to rise by about 50 per cent by 1970 he would be surprised if the number of retail sites increased very greatly during that time.

BP's Third Swiss Loan

The British Petroleum Co. Ltd has placed a third loan of 60 million Swiss francs, approximately £5 million, on the Swiss market. The offer is being made to the Swiss public by a syndicate of Swiss banks headed by the Swiss Credit Bank. The loan will be issued at par, and bear interest of 4½ per cent per annum. The loan is unsecured and is for a term of fifteen years, but the Company has the right to repay it in whole or in part after ten years.

The Company placed loans for 60 million Swiss francs each, on similar terms, on the Swiss market in March 1959 and April 1960.

First Evidence of Life Beyond Earth

Three scientists of Fordham University and Esso Research and Engineering Company believe they have discovered the first physical evidence of life forms beyond our planet.

The scientists, Dr Bartholomew Nagy and Dr Douglas J. Hennessy of Fordham and Dr Warren G. Meinschein of Esso Research, reached this conclusion after analysis of a stony meteorite which fell near Orgeuil, France, on 14 May 1864.

Using infra-red and ultra-violet spectroscopy, X-ray diffraction, and high molecular weight mass spectroscopy, they detected hydrocarbons similar to those occurring in living matter on earth. In a recent report to the New York Academy of Sciences they stated that from the studies they have carried out so far, it appears that biogenic processes occur and that living forms exist in regions of the universe beyond the earth.

CFP Increases U.K. Investment

Total Oil Products (G.B.) Ltd recently increased its authorized capital from £2 million to £2½ million. The new capital has been wholly subscribed by the parent company, Compagnie Française des Pétroles.

Total Oil Products opened its first filling station in the U.K. at the beginning of December, and hopes to have 150 garages handling its products by June.

Insects Threaten Hydro-Electric Scheme

A plague of phasmid insects has been threatening the success of the Kiewa Hydro-Electric scheme in Victoria, Australia. The insects, about four inches long and similar in appearance to the praying mantis, were ravaging a 6000 acre forest region in the Australian Alps which was acting as a rain catchment area for the scheme.

Observers directing spraying operations by radio. (Inset) The insect causing all the trouble

The State Electricity Commission called BP in to help in the war against the insects. The whole area was sprayed with insecticide consisting of methalion mixed with BP *Diesoleum*. The job of the *Diesoleum* was to ensure that the spray would not evaporate or drip to the ground but stick to the foliage or trees.

First reports suggest that the operation has been largely successful.

Birmingham Students Dinner

Photographs by George Sell

Among those present at the annual dinner of the Birmingham University Chemical Engineering Society were: (Top) *Professor J. T. Davies* (head of the Department of Chemical Engineering) and *Dr F. J. Dent* (Gas Research Council). (Centre) *Professor S. R. M. Ellis* (Department of Chemical Engineering); *H. W. Stevenson* ("Shell" Research Ltd); *J. C. Wood-Mallock* (Manchester Oil Refinery Ltd); *H. Fossett* (Associated Ethyl Co. Ltd); *C. S. Windebank* (Esso Research Ltd); *Dr D. Clayton* (Imperial Chemical Industries Ltd); *G. A. Dickins* (Mobil Oil Co. Ltd); *Professor Frank Morton* (Manchester College of Science and Technology). (Bottom) *G. Davies* (The British Petroleum Co. Ltd); *G. V. Jeffreys* (Birmingham University); *R. S. Law* (Whiffen & Son Ltd); *P. F. Ellis* (BP Refinery (Llandarcy) Ltd); *L. G. Miskin* and *A. C. Gill* (Department of Chemical Engineering); *B. Bethell* (Manchester College of Technology); *Professor Frank Morton* and *J. Cadle* (Birmingham University); *E. A. Goss* (President of the Guild of Undergraduates, Birmingham University); *R. Hunt* (Imperial College, London); *P. Cook* (University College, London); *P. Long* (Birmingham University)

The Fourteenth Annual Dinner of the Birmingham University Chemical Engineering Society was, like its predecessors, a function of much enjoyment and entertainment. Held in the Students Union of Birmingham University on 1 March, nearly 200 students and guests were present. The guests included representatives of many industries employing chemical engineers and provided a good opportunity for students and prospective employers to discuss matters of mutual interest. It was presided over by R. H. Booth, chairman of the Society, and guest of honour was J. G. Collingwood.

The Chemical Engineer in Research

Proposing the toast "The Chemical Engineer in Research", **Professor J. T. Davies,** head of the Chemical Engineering Department and President of the Society, said that the chemical engineer was now rather fashionable, possibly because he was not very well understood. The chemical engineer could in fact talk about both chemistry and about engineering with equal facility. In his work the chemical engineer was concerned first with applied physical chemistry, then with the scale-up of physical and chemical processes, and finally with the design of chemical plant.

Research was tied-in with applied physical chemistry. In many physical chemistry laboratories, research followed the work of the physicist, and the physical chemist tended to become a chemical physicist. As a consequence, more research in classical physical chemistry fell to the chemical

engineer. The scaling-up of processes also needed knowledge of physics, of chemistry, and of process variables such as flow properties.

The chemical engineer on the plant must therefore have knowledge of research, and it was desirable that a research section should be part of every chemical engineering plant.

In New Zealand there had recently been a growing demand for chemical engineers for such varied operations as the utilization of geothermal resources, the curing of tobacco, and the curing of hops used in the manufacture of beer.

Concluding, Professor Davies said that while some maintained that the great romance of the century had been the marriage of space and time, another important romance had been the union of engineering and chemical research, the offspring being chemical engineering. Research, he said, would always remain an essential part of chemical engineering.

J. G. Collingwood said that it was appropriate that he should be replying to the toast of the chemical engineer in research, since he happened to be one himself, albeit in an administrative position, responsible for industrial research in the U.K. He would like to reply therefore as an industrial researcher.

There were two differences between industrial and academic research. It was said that not knowing what one was looking for until it was found was pure research, whereas in industry the objective was much clearer. Secondly, in academic research knowledge was sought for its own sake, whereas in industrial research a discovery was only completely successful if it contributed to profits and to the well-being of the community. The great similarity between the two was that they both required the spirit of creativity which only blossomed when it was demanded. In industrial research the demand is made by the market itself. As an example he referred to the butter market in which the replacement product, margarine, failed to satisfy completely for lack of the right aroma. This demanded an intensive physical and chemical research programme culminating in the design of a complicated synthetic process by the chemical engineer.

The chemical engineer in research must never lose sight of the true extent of the market. For instance, the oil companies would have been unable to expand if they had confined themselves to considering the "oil for lamps" business, but when they found an outlet for their products in internal combustion engines they were made to realise that their real market was the consumer of portable energy.

Having said that research was the point at which what is commercially desirable and technically feasible are combined into the product, who better than the chemical engineer, with his wide training, to work on the design of plants for the satisfaction of the demand, or, indeed, help to outline the programme for basic physical and chemical research. After his training the chemical engineer had to become a manager to reach his full potential in research. He had to plan the use of the resources of men, money and equipment at his command to ensure their optimum use, and at all times to be aware of what was going on in the world around him.

The Guests

D. C. Hunter, junior treasurer of the Society, said they were always pleased to welcome their friends to their annual dinner. They included members of the chemical engineering profession, from various industries, and from the chemical engineering societies of other universities. He also took the opportunity of thanking all those who had looked after the students so well during their vacation courses.

C. S. Rees (Associated Ethyl Co. Ltd) expressed the thanks of the guests for the hospitality and enjoyment of the evening.

The Society

The toast of "The Society" was aptly proposed by **Professor Fraser Mackenzie,** head of the French Department of the University, who gave the assembled company much to think about.

Replying, **R. H. Booth,** chairman of the Society, referred to social and sporting successes of the past year, and thanked all there who had contributed so much to these successes. He also expressed his appreciation of the help which he had received from the members of the committee.

TRUSTEES OF THE INSTITUTE OF PETROLEUM BENEVOLENT FUND

Revenue Account for the Year ended 31 December 1960

To: Grants paid		£170	0	0	
Balance being surplus revenue for year ...		286	12	8	
	£456	12	8		
By: Subscriptions and donations received during year					£270 19 11
Interest and dividends received (gross) ...					185 12 9
					£456 12 8

Balance Sheet 31 December 1960

Revenue Account					Investments at Cost			
As at 31 December 1959	£4,252	14	2		£1,450 4½% Defence Bonds (Conversion Issue) ...	£1,450	0	0
Add: Surplus for year	286	12	8		£300 3½% Defence Bonds (Conversion Issue) ...	300	0	0
	£4,539	6	10		£200 3½% Defence Bonds (2nd Conversion Issue)	200	0	0
					£100 5% Defence Bonds (Conversion Issue) ...	100	0	0
					150 Lloyds Bank Ltd £1 Shares	393	10	9
					120 Associated Electrical Industries Ltd Ordinary Stock £1 Units	365	19	6
					200 Imperial Chemical Industries Ltd Ordinary Stock £1 Units	379	9	6
					150 Tube Investments Ltd Ordinary Stock £1 Units	436	2	8
							£3,625	2 5
					(Market Value £4,017)			
					Sundry Debtor—Income Tax recoverable ...		30	10 2
					Balance at Bank—Deposit account	£500	0	0
					Current account	383	14	3
							883	14 3
	£4,539	6	10				£4,539	6 10

Scottish Union House,
25 Bucklersbury,
London, E.C.4.
20 *March* 1961.

We have examined the above Revenue Account and Balance Sheet with the books and vouchers of the Fund and find it to be in accordance therewith.

(Sgd) Smith & Williamson,
Chartered Accountants.
Auditors.

Iran Oil Statistics 1957-60

Net crude oil production from the Consortium Agreement Area of Iran totalled 383,378,104 brl during 1960, a gain of 13·8 per cent compared to 1959. A total of 247,884,233 brl was delivered for export from Abadan, Mashur, and Kharg, and 128,607,224 brl were delivered to the Abadan refinery.

Production at the Naft-i-Shah field in 1960 was 2,370,996 brl, a rise of 23·8 per cent over the previous year.

A 9·5 per cent increase in product output was achieved at Abadan refinery where 119,458,598 brl were produced during the year. Gross production at Kermanshah refinery was 919,251 brl, 21·9 per cent up on 1959.

The total volume of sales of refined products in Iran rose by 17 per cent during the year to reach a figure of 24,439,047 brl. The highest volume of product sales was achieved by fuel oil, where sales of 7,212,187 brl were an advance of 13·1 per cent over 1959. Sales of other products were, kerosine 6,136,908 brl (10·8 per cent increase); gas oil 5,353,859 brl (21·3 per cent); and gasoline 3,935,379 brl (10·8 per cent).

Natural gas production by the Consortium Operating Companies during the year was 264,454 million cu ft, compared with 234,767 million cu ft in 1959. Of the former total 35,430 million cu ft were utilized, 68,064 million used and then flared, and 160,961 million flared. Total Naft-i-Shah gas output amounted to 1678 million cu ft in 1960—325 million cu ft more than that produced in 1959. Of this, 870 million cu ft was utilized and 808 million flared.

A more detailed statistical picture of oil operations during 1957-59 is provided in the tables reproduced below, which are obtained from statistics published by the National Iranian Oil Company. It should be noted that metric measure is used.

Iran Petroleum Statistics

(1957–1959)

Refining

	1957		1958		1959	
	cu m	*Per cent Inc.*	*cu m*	*Per cent Inc.*	*cu m*	*Per cent Inc.*
Abadan:						
Refinery capacity	29,300,000	—	29,300,000	—	29,300,000	—
Crude runs to stills	18,215,500	34·3	17,999,000	− 0·9	18,691,270	3·8
Refinery output:						
Aviation turbine fuel	—	—	—	—	571,154	—
Aviation spirit	691,518	61·2	712,444	3·0	720,508	1·1
Lubricating oil	16,965	35·9	18,028	6·3	16,814	− 0·6
Bitumen	198,768	− 7·2	201,503	1·4	256,168	27·1
Imshi	595	−34·8	724	21·6	811	12·0
LPG	1,419	5·1	2,116	49·1	3,492	65·0
Motor spirit	2,472,789	20·9	2,696,271	9·0	2,680,458	− 0·6
Cracked gasoline	266,807	−15·4	158,080	−40·7	98,382	−37·7
Kerosine	2,405,128	29·7	2,464,369	2·5	2,382,766	− 3·3
Special solvents	107,644	13·3	121,975	13·3	109,503	−10·6
Vaporizing oil	443,006	34·1	464,382	4·8	299,207	−35·5
Gas oil	1,712,365	37·3	2,122,730	24·0	2,516,648	18·5
Diesel oil	1,296,020	42·7	1,078,851	−16·7	1,040,855	− 3·5
Fuel oil	7,521,185	46·7	6,899,933	− 8·3	6,652,583	− 3·6
Total	17,134,209	36·2	16,941,406	− 1·1	17,348,850	2·4
Kermanshah:						
Refinery capacity	180,000	—	180,000	—	180,000	—
Crude runs to stills	155,115	− 3·4	140,488	− 9·4	125,397	−10·7
Refinery output:						
Gasoline	71,602	—	69,469	− 3·0	58,512	−18·7
Kerosine	50,833	5·6	46,748	− 8·0	44,024	− 5·8
Gas oil	4,550	54·0	4,334	− 4·7	3,648	−15·8
Fuel oil	24,462	−12·2	17,220	−29·6	13,658	−20·7
Unfinished products	1,320	88·5	546	−59·0	3,666	571·4
Total	152,767	− 3·4	138,317	− 9·4	123,508	−10·7

Consumption

Internal sales*:						
Fuel oil	759,482	0·4	874,204	15·1	1,026,853	17·4
Kerosine	712,938	19·2	751,886	5·4	886,174	17·8
Gasoline	463,515	9·5	523,997	13·0	574,692	9·7
Gas oil	384,800	29·1	519,708	35·0	707,037	36·0
Four major products	2,320,735	11·8	2,669,795	15·0	3,194,756	19·6
All others	164,045	12·4	136,103	−17·0	170,877	25·5
Total	2,484,780	11·8	2,805,898	12·9	3,365,633	19·9

* Adjusted.

Drilling

	1957		1958		1959	
	No of wells	*Metres drilled*	*No of wells*	*Metres drilled*	*No of wells*	*Metres drilled*
National Iranian Oil Co.:						
Sarajeh Field	—	—	2	4,545	3	6,591
Naft-i-shah Field	—	—	2	1,770	3	1,107
Alborz Area	2	5,249	4	5,580	1	2,316
Mazandaran Area	2	3,000	—	—	—	—
Sorkheh Area	—	—	1	611	1	1,254
Gorgan Area	—	—	—	—	1	1,185
Total	4	8,249	9	12,506	9	12,453
NIOC (IOEPC):						
Agha Jari Field	5	8,911	9	12,352	6	11,423
Haft Kel Field	—	—	—	—	—	—
Gach Saran Field	1	2,708	10	9,708	8	16,341
Naft Safid Field	3	4,954	2	2,780	2	251
M.I.S.	1	—	10	85	3	128
Lali Field	4	48	1	—	—	—
Ahwaz Field	1	1,547	1	4,789	1	33
Binak Area	—	—	1	1,779	1	1,520
Kouhmond Area	—	—	—	—	1	1,692
Total	15	18,168	34	31,493	22	31,388
NIOC (SIRIP):						
Persian Gulf Area	—	—	—	—	1	1,943
Zagrous Area	—	—	—	—	1	186
Total	—	—	—	—	2	2,129
NIOC (IPAC):						
Persian Gulf Area	—	—	—	—	1	2,740

Oil Revenue

	1957		1958		1959	
	£	*Per cent Inc*	£	*Per cent Inc*	£	*Per cent Inc*
Stated payment:						
Cash	19,628,580	49·4	23,282,612	18·6	25,763,624	10·6
Oil	1,722,556	−20·0	1,635,468	− 5·0	252,885	−84·5
Total	21,351,136	39·4	24,918,080	16·7	26,016,509	4·4
Income Tax	54,687,214	38·5	63,421,274	16·0	67,728,663	6·8
Grand Total	76,038,350	38·8	88,339,354	16·2	93,745,172	6·1

PRODUCTION

	1957			1958			1959		
	Total no of wells	*Prod wells*	*Prod cu m 1000*	*Total no of wells*	*Prod wel s*	*Prod cu m 1000*	*Total no of wells*	*Prod wells*	*Prod cu m 1000*
NIOC:									
Naft-i-shah Field ...	3	2	313	4	2	304	6	4	304·4
NIOC (IOEPC):									
Ahwaz Field ...	—	—	—	—	—	—	7	1	3
Agha Jari Field ...	37	21	26276	44	28	29189	48	33	34782
Haft Kel Field ...	48	20	6992	48	20	8350	48	20	8732
Gach Saran Field ...	14	4	2800	18	4	3438	24	13	3435
Naft Safid Field ...	27	12	2496	28	14	3475	29	17	3136
M.I.S. Field ...	257	17	3352	257	24	2820	257	31	3558
Lali Field	15	3	615	15	4	1014	15	5	866
Total	398	77	42531	410	94	48286	428	120	54512
Natural gas	*m cu ft*		*Total per cent*	*m cu ft*		*Total per cent*	*m cu ft*		*Total per cent*
NIOC:									
Naft-i-shah:									
Utilized	793·37		60·99	816·86		61·65	825·30		60·99
Flared	507·39		39·01	507·87		38·35	527·79		39·01
Total prod ..	1,300·76		100·00	1,324·73		100·00	1,353·09		100·00
NIOC (IOEPC):									
Utilized	24,784·88		13·61	25,470·99		12·45	31,230·05		13·30
Used expansively then flared ...	41,149·72		22·61	53,259·93		26·02	58,796·95		25·04
Flared	116,057·16		63·78	125,915·13		61·53	144,740·11		61·66
Total prod ...	181,991·76		100·00	204,646·05		100·00	234,767·11		100·00

PIPELINES

	1957			1958			1959		
	L'gth Km	*Dia in*	*Thro'-put cu m 1000*	*L'gth Km*	*Dia in*	*Thro'-put cu m 1000*	*L'gth Km*	*Dia in*	*Thro'-put cu m 1000*
Trans Iranian ...	940	10/12	575	940	10/12	1,559	940	10	2,051
Azna-Esfahan ...	—	—	—	234	6	110	234	6	246
Naft-i-shah–Kermanshah ...	220	3	148	220	3	142	220	3	148
Naft-i-shah–Kalenter ...	70	4	112	70	4	116	70	4	109
Naft-i-shah–(No. 2 P.S.)–Kermanshah ...	—	—	—	—	—	—	170	4	—
Tehran–Shahrood	—	—	—	—	—	—	379	8	—
Tehran–Resht ...	—	—	—	320	6	—	320	6	—
Agreement area	3,182	4/22	40,776	3,252	4/22	46,703	3,412	4/28	52,540

EXPORTS

	1957		1958		1959	
	cu m	*Per cent Inc*	*cu m*	*Per cent Inc*	*cu m*	*Per cent Inc*
Crude oil:						
Trading companies from Mashur ...	22,169,059	35·8	28,017,723	26·4	33,574,140	19·8
Trading companies from Abadan ...	—	—	18,365	—	178,730	873·2
NIOC from Mashur	380,289	−25·0	356,890	− 6·0	56,865	−84·1
Crude delivered on account of trading companies to Abadan refinery ...	16,453,536	35·8	15,790,985	− 3·9	16,128,160	2·13
Total	39,002,884	34·8	44,183,961	13·3	49,937,895	13·0
Crude and products actually exported...	37,398,128	37·3	42,804,795	14·4	48,158,270	12·5
		Per cent total		*Per cent total*		*Per cent total*
Distribution of oil exports:						
Western Europe ...	17,951,101	48	21,830,445	51	24,079,135	50
South-East Asia ...	5,983,700	16	5,992,671	14	6,260,575	13
Africa	5,609,720	15	8,989,007	21	8,186,906	17
Australasia	4,487,775	12	3,852,432	9	2,889,496	6
North America ...	1,869,906	5	856,096	2	2,889,496	6
Far East	1,495,926	4	1,284,144	3	1,444,748	3
Middle East ...	—	—	—	—	2,407,914	5
Total	37,398,128	100	42,804,795	100	48,158,270	100

Petroleum in Parliament

Government Holdings in BP

The current value of government holdings in the British Petroleum Company is £290 million. This figure was quoted by the Chancellor of the Exchequer during question time on 28 February. The original investment in the Company, he said, cost £5 million.

Seismological Research

The Department of Scientific and Industrial Research has received an application for a grant for seismological investigations at Cambridge. The Parliamentary Secretary to the Ministry of Science gave this information during question time on 2 March, and said that a further similar application was expected from Edinburgh University.

Industrial Pipeline Legislation

The Minister of Power was asked to make a further statement about Government policy concerning development of pipelines on 6 March.

He said the Government had decided it would be necessary to legislate to secure in the national interest the orderly development of privately owned industrial pipelines. The legislation would allow objections to a project to be made by public bodies or private individuals. In certain cases, such as where compulsory powers are asked for, the Minister's decision would be subject to Parliamentary approval.

Regent Oil Company

The Minister of Power was asked on 13 March on what scale the Regent Oil Company had dismissed senior executives as redundant, and to what extent this policy controverted undertakings given at the time the Trinidad Oil Company was taken over by the Texas Company.

The Minister replied that the employment of people in the U.K. was outside the scope of the undertakings given.

Nuclear-Powered Ship

During question time on 15 March, the Minister of Transport would neither confirm nor deny newspaper reports that he does not intend to go ahead with the project for a nuclear-powered merchant ship. He said he would make a statement as soon as possible.

Oil and the National Economy

The Prime Minister turned down a request on 21 March for the Chancellor of the Exchequer and the Minister of Power to issue a joint White Paper on the effect of the oil industry's operations on the national economy. He did so on the grounds that adequate statistics are already available.

However, he did say that he would consider a suggestion from the Leader of the Opposition that the details should be included in the White Paper on the balance of payments.

Pipelines on Railway Property

The Minister of Transport plans to include provisions for the railways to operate pipelines on their property in a Bill to be introduced in the next Session, he told a questioner on 22 March.

Wilfred Pohl Retires

Standardization Sub-Committee C Luncheon

Wilfred Pohl, who retired at the end of February after 27 years' service with the Shell Group and 12 years previously in the bitumen side of the industry, was the guest of honour at a luncheon given by his colleagues on Standardization Sub-Committee C—Lubricants and Wax. Mr Pohl had been chairman of that committee and of its predecessor Sub-Committee 6—Lubricants for several years.

The chair at the luncheon was taken by C. F. McCue, the new chairman of Committee C, who first welcomed as guests W. H. Thomas, the chairman of the main Standardization Committee, and George Sell, the editor of the IP publications. Mr Sell would himself be retiring at the end of March and Mr McCue offered best wishes on behalf of all present.

The chairman said that he had known Mr Pohl for many years. He was one of those men that one met in the various places where oil men gathered together, not only in Britain but on the Continent also. He was also one of those rare persons—a recognized authority on a wide variety of topics. In these days of extreme specialization, such people were very rare indeed.

They were all appreciative of the hard work which Mr Pohl had done, during the years as their chairman and previously, as a member of various panels, working groups, and so on. His contributions to their efforts had gone far beyond the chairmanship of meetings. Much had been done behind the scenes by Mr Pohl and, as a result of his efforts, an efficient, effective, and happy team had been developed.

On behalf of the members of the Sub-Committee and he was sure also of the various Panels, he wished Mr Pohl a long happy retirement.

W. H. Thomas, chairman of Standardization Committee, also expressed the wish that Mr Pohl would live long to enjoy much leisure. Mr Pohl had always been ready to give a sound opinion on technical subjects related to oil, and his opinion was one upon which much reliance could be placed. They were very sorry to be losing Mr Pohl and he hoped that, even in his retirement, they would be able to call upon him for help and guidance when the need arose.

Wilfred Pohl, thanking them for their expressions of good will said that, like many of those present, he had started as a chemist. He had started his career in the bitumen field, first being concerned with emulsions, then with cold asphalt, and finally with hot asphalt. After joining the Shell organization as a bitumen expert he had eventually drifted into the lubricants field, of which he had acquired some knowledge during the past twenty years.

Speaking of his IP committee work, Mr Pohl said that this had given him much pleasure. Sub-Committee C was a friendly team, not afraid to express their own thoughts and opinions. He was sure that their work would thrive under the chairmanship of Mr McCue.

(Left to right) *J. Romney, W. Pohl, H. L. Bingham, W. H. Thomas, P. C. Hall, C. F. McCue, R. P. Langston*

(Left to right) *G. H. Harries, R. L. Martin, P. C. Hall, W. Pohl, D. Wyllie, E. Herbert*

Books and Films

Fuel Research in Britain

When the Fuel Research Board was set up in 1917, by the then newly-formed Department of Scientific and Industrial Research, its terms of reference were "To investigate in the broad national interest the nature, preparation, utilization, and treatment of coals and other fuels, and of products derived from fuels". One of the first actions of the Board was to build the Fuel Research Station at Greenwich, and there it remained until 1958 when, as the result of a review of fuel research carried out by nationalized industries and by research associations, it was considered unnecessary to continue work on many items of the existing programme.

Under the title "Fuel Research 1917–1958" the DSIR has recently published a review of the achievements of the Station during its 40 years existence. This summarizes the results of many activities and, giving references to the location of the full reports on many investigations, forms a valuable source of data for the fuel technologist.

While it is only natural that investigations on coal problems occupy a considerable part of the 120 pages, there is much of interest and value to the petroleum industry. Thus, reference is made to the work on methane synthesis which was started in 1940 and culminated in 1948 with a full-scale plant designed and operated. Work was also carried out on the liquefaction and storage of methane. Much work was done at Greenwich on the production of oil from coal by the carbonization and hydrogenation processes and also by the Fischer–Tropsch synthesis. The first objective of the latter investigations was the production of lubricating oils and some degree of success was obtained. Later work on this process was related to liquid fuel production.

The flow properties of residual fuel oils was a subject given much attention in the last decade at the Station and there was close collaboration with the Fuel Oil Flow Panel of the IP and with AFLAC. Among the other aspects of fuel oil on which work was done was the effect of constituents of fuel oil on water-tube boilers, the pollution of the sea by oil, and the use of colloidal fuel.

Work on the production of flame-warfare materials is referred to, particularly in regard to gelled fuels, and data are given on the solidification of motor spirit.

With the object of reducing oil requirements in times of emergency, the possibilities of using pulverized fuel in a diesel engine were first considered in 1936 but the investigations were not brought to completion owing to the outbreak of war. A large amount of work was also done on colloidal fuel.

The book is based upon notes provided by past and remaining members of the Fuel Research Station and has been edited by Dr Alan C. Monkhouse, with the assistance of J. H. Carlile. It contains references to 151 published main reports and is published by HMSO at 15*s* 0*d* net.

Revised Oil Memoranda

The latest of its oil memoranda to be brought up to date by the Petroleum Information Bureau are *Oil in the U.S.A.*, *Oil in Western Europe*, and *Transportation of Oil—Tankers*. Copies can be obtained free of charge from the Bureau at 29 New Bond Street, London, W.1.

The Geology and Geophysics of Texas

The Dallas Geological and Geophysical Societies have sponsored the publication of three books for those interested in oil exploration in Texas.

"The Geology and Geophysics of Cooke and Grayson Counties, Texas", is a 211-page symposium containing illustrations of selected oilfields, stratigraphic cross-sections, structure maps, electric logs, regional gravity maps, well velocity information, and reflection seismic data. It is priced at $10.00.

"The Geology of the Ouachita Mountains" is a 207-page illustrated symposium presenting the depositional and structural setting of the western Ouachitas, and is priced at $10.50.

"The Texas Geological Highway Map", printed in eleven colours, shows surface geologic information, highways, principal towns, and landmarks. It is available rolled for $1.25 and folded for $1.00. Copies of all three publications are available from Dallas Geological Society, Department AAPG, 1200 Vaughn Building, Dallas 1, Texas.

Review of Iran's Oil Industry

"Perspective", a booklet published by NIOC to mark the tenth anniversary of the nationalization of the Iranian oil industry, packs a lot of information into its sixteen pages.

It traces the country's oil history from the time of the first known man-made oil well in the year 500 B.C., through to the granting of the first concession to Baron Julius de Reuter in the 1880's, right up to the present day.

Surveying the present Iranian domestic scene, the booklet says that current oil revenues are running at the rate of £100 million a year. It discusses how much of this income is used to finance hydro-electric and irrigation projects, as well as factory building and social services.

The booklet, which states that NIOC is currently employing about 60,000 people, ends with a review of the Company's welfare and social activities, which include the upkeep of eight hospitals, with four more under construction, and sixty-two clinics.

Castrol's New Films

Three new films of motor and motor cycle sport have recently been added to the Castrol Film Library and are available on free loan to clubs. The most spectacular and picturesque of these is *Austrian International* which in 32 exciting minutes tells the story of the 1960 international six days trial. The film is much enlivened by the racy and humorous commentary of John Whatmough and there are some magnificent glimpses of the enchanting Austrian scenery and of the hospitable people of that country

Second of the trio is *Highland Fling*, a moving account of the 1960 RAC International Rally of Great Britain. This report of a really tough 2000-mile event contains some striking night shots and thrilling moments. An excellent commentary is spoken by Raymond Baxter and running time is 33 minutes.

Last but by no means least is *The Living Museum*, and this records in about 20 minutes a visit to the Montague Motor Museum at Beaulieu in the New Forest, as well as

the classic Brighton Race and a Silverstone event for historic cars.

Enquiries regarding the loan of 16-mm gauge copies of these films should be addressed to Castrol Film Library, Group Public Relations Dept, Castrol Ltd, Castrol House, Marylebone Road, London, N.W.1.

Prospectus of Full-Time Postgraduate Courses

The full-time postgraduate courses being organized by the Imperial College of Science and Technology for 1961–62 are described in the new prospectus which is available from The Registrar of the College, Prince Consort Road, London, S.W.7.

The courses are all of one or two years duration and lead to a degree or diploma. Many of them are accepted by the Department of Scientific and Industrial Research for the tenure of Advanced Course Studentships.

Coal Tar Fuels

Seventeen years have passed since the Association of Tar Distillers published the first edition of "Coal Tar Fuels", so it is not surprising that the second edition, published recently, has been completely re-written.

The various chapters cover source and production, chemical composition and physical properties, combustion and flame, design of equipment for storage and handling, liquid fuel burners and general equipment, as well as applications.

One million tons of liquid coal tar fuels are consumed in Britain every year. Nearly all of it is produced at coke-oven plants and gasworks as a by-product of the high temperature carbonization of coal, and this virtually new monograph is a valuable and authoritative source of reference.

It has been edited by W. T. Huxtable of the Coal Tar Research Association, and costs 1 guinea from the Association of Tar Distillers, 9 Harley Street, London, W.1.

Lubrication Films

Lubrication is the theme of the latest films produced by The British Petroleum Co. Ltd. First, *The Hidden Power* discusses technical aspects of industrial lubrication and points out the wide variety of conditions under which lubricants have to function. Attention is directed to the need for constant research to ensure that lubricants keep in step with engineering and industrial progress.

The second film is entitled *Service to Industry* and illustrates various aspects of the Company's lubrication service. This is shown to involve not only laboratory examinations of new or used lubricants but also on-the-spot surveys in a factory. It also provides for the development of new formations to meet special requirements.

BWRA Report

Because present day welding frequently involves using new materials and working to standards which were inconceivable only a few years ago, the British Welding Research Association is increasingly being called upon to meet specific problems in design, in selection of welding conditions, and in the choice of materials.

In outlining its work in its Fifteenth Annual Report 1959–60, the Association shows how its activities have a bearing on industrial problems and economics. The study of the welding arc—long regarded only as a source of heat—is discussed in relation to filler wire diameters and compositions, the development and improvement of welding equipment, methods of gas shielding, and the establishment of optimum welding conditions for the whole range of structural metals.

The Association says in its report that it believes that the replacement of mechanical joints by welded connexions in high pressure small bore pipe systems could provide a far-reaching economy in the construction of chemical plant.

LABOUR STATISTICS FOR THE U.K. PETROLEUM REFINING INDUSTRY

The following figures are taken from the February 1961 issue of the *Ministry of Labour Gazette*.
(cf. previous figures given in the *IP Review* 1960, **14**, 340)

Figures in italics are the averages for all the industries covered by the tables.

	Men (21 *and over*)	*Youths and Boys*	*Women* (18 *and over*)		
			Full time	*Part time*	*Girls*
No of workers covered by remuneration statistics ...	19,647	1,078	980	520	39
Average earnings in second pay-week in October 1960 (shillings)	306/11 *290/8*	155/5 *130/0*	153/10 *148/4*	82/2 *74/10*	— *96/10*
Average number of hours worked in this pay-week ...	47·1 *48·0*	42·9 *44·3*	41·5 *40·5*	22·8 *21·7*	— *41·4*
Average hourly earnings in this pay-week (pence) ...	78·2 *72·7*	43·5 *35·2*	44·5 *44·0*	43·2 *41·4*	— *28·1*
			Males	*Females*	
Numbers employed (December 1960)			33,000	7,400	—
Numbers unemployed (at 16 January 1961)			332	44	—

PETROLEUM EQUIPMENT ORDERS

Last year, British-based oil companies placed in the U.K. orders valued at £118,911,930, according to figures published by the Council of British Manufacturers of Petroleum Equipment, on behalf of the Oil Companies Materials Secretariat. This is £1,655,036 more than the total for the previous year. Some 56 per cent of the orders were destined for use overseas.

Orders placed during the final quarter, however, were almost £5½ million lower than in the same period of 1959. They stood at £28,604,545 compared with £34,077,209 the previous year. Full details for this period are given below. In only five of these are the figures above those for the similar quarter of 1959. The largest increase, 96 per cent, was recorded by specialized equipment for oil refineries.

Britain also receives very substantial orders from companies not based in Britain and from countries, such as Mexico, where the oil industry is state-owned. These are not included in the above total, and no precise details are available as to their worth, but it has been estimated by the chairman of the CBMPE that they may add up to 25 per cent to the value of orders received from British-based oil companies.

	1960 *Oct.–Dec.*	1959 *Oct.–Dec.*
Geophysical and other exploratory equipment, etc.	41,617	42,854
Specialized equipment for oil drilling and production including oil casing, tubing, etc.	1,391,599	2,590,051
Specialized equipment for oil refineries, etc. (not including pumps and valves)	1,483,572	756,089
Drums and can-making, filling and cleaning equipment, kerbside pumps and other metering and dispensing equipment, etc. ...	1,249,225	1,772,458
Railcars, road tankers, aircraft refuellers, etc.	853,537	1,228,590
Drums, drumsheets, and tinplate ...	1,061,268	1,875,636
Tankage (including tank fittings) ...	1,443,198	1,430,547
Tubulars, pipe fittings, and valves (ferrous and non-ferrous) ...	3,291,165	3,292,154
Pumps (excluding slush, oilwell, and kerbside)	435,225	467,798
Boilers, boiler house plant and accessories, etc.	169,435	148,316
Electrical equipment—motors, generators, transformers	1,039,226	945,415
Instruments, meters and gauges, etc.	537,810	650,923
Prime movers and compressors ...	638,027	673,668
Machine and hand tools, welding and miscellaneous machinery, and stores	1,442,548	1,863,383
Ferrous and non-ferrous plates, sections, sheets, and bars ...	724,459	707,100
Automotive equipment, all types ...	2,693,261	2,901,412
Laboratory equipment and chemicals, including hospital and medical supplies	360,187	398,465
Bulk chemicals, catalysts, barytes, etc.	7,087,254	8,729,830
Cement and other building materials and hardware, including timber	525,104	907,788
Commissary, general requisites for office, warehouse, household, clubs and sports, etc.	2,136,828	2,694,732
	£28,604,545	£34,077,209

Equipment Developments

New Gas Turbine

A 600 hp gas turbine, which is expected to surpass piston engines in competitive applications, is being developed by the Solar Aircraft Company, of San Diego, California. Among the target characteristics for the engine is a fuel consumption of ·4 lb/hp-hr, equal to reciprocating engines and well below current industrial gas turbine performance.

The new engine will be a completely axial flow regenerative machine with a six-stage compressor, dual rotary re-generators, a single-can combuster, a single-stage gas producer turbine, and a single-stage power turbine. It will operate at a compressor pressure ratio of 3·8 and have a rotative speed of 21,500 revs/min.

Pipe Bender for Use in the Field

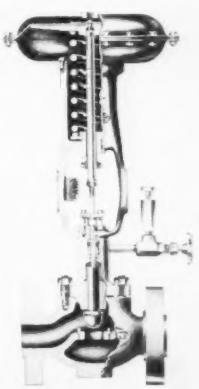
Chamberlain Industries Ltd is producing a new portable, hydraulically operated pipe bending machine with a capacity for bending up to 18 in od × ½ in wall thickness mild steel pipe. The power required to pressurize the hydraulic ram is provided by a simple air/hydraulic pump powered by a small compressor or air-line.

The conventional type of forming head has been replaced by two pivotting arms to which the pipe clamps are fitted, thus permitting the pipe to be bent to form part of the machine's structure. Under normal operation a 10 bend can be made in one thrust in a length of 18 in od × ½ in wall pipe in under 10 minutes.

Heavy Duty Single Seat Control Valve

A new Masoneilan single seat heavy duty globe valve body has been introduced by the Crosby Valve Engineering Co. Ltd.

Extra heavy top guiding of the plug eliminates the need for orthodox bottom guiding, reducing turbulent flow and trouble due to any solid particles which may be in suspension. Flow capacity is approximately equal to that of the equivalent line size double seat control valve. The new valve will withstand considerably greater out of balance pressure across the seat compared with that of an orthodox single seat control valve and still give tight shut-off and stable throttling control.



New "Masoneilan" valve

Trade Literature, etc.

Oil Gasification Plant for Dublin

P.G. Engineering Ltd, an associate of the Power-Gas Corporation Ltd of the Davy-Ashmore Group, is to build a cyclic catalytic oil gas plant for the Alliance and Dublin Consumers Gas Company. The plant will consist of two units of the Segas process, producing town gas from heavy oil and is expected to be completed by August 1962.

The Company is also building Segas plants in Gothenburg, and Madrid.

New Catalogue of Maps

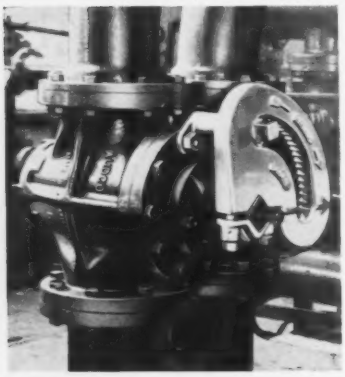
A new catalogue of maps lists all the maps published by the Directorate of Overseas (Geodetic & Topographical) Surveys which are available to the public. It has loose leaf binding to allow monthly addition lists to be inserted. Price is 10*s* plus 2*s* 6*d* postage. Copies are obtainable from Edward Stanford Ltd, 12–14 Long Acre, London, W.C.2.

Annotated Metallographic Specimens

Metal Services has produced a collection of annotated metallographic specimens to meet the need of lecturers who require microspecimens of known composition and structure. There are 139 individual specimens of various alloys available so far, and the notes which accompany them give full details of structures and methods of preparation.

A descriptive booklet can be obtained from the Company at Reliant Works, Betchworth, Surrey.

Light Duty Gear Unit for Audco Valves



A new light duty gear unit is available for use with certain wrench-operated Audco valves, and may be fitted to valves already in service. The unit has a cast iron quadrant which is clamped to the plug stem of the valve. Meshing with the quadrant is an *Audcoloy* pinion mounted on a stub shaft attached to the valve. Internal teeth give correct rotation and afford protection to the gear and operator.

A brochure obtainable from Audco Ltd, Newport, Shropshire, England, gives details of the unit.

Diesel Engines for Turkey

Diesel engines and other equipment worth over £100,000 is being supplied by Ruston and Hornsby Ltd, and their associate company Davey, Paxman, & Co. Ltd, for the new oil refinery being built at Mersin, Turkey.

The refinery, a joint project of Socony Mobil, BP, and Shell, will process 65,000 bd of blended Middle East crude oil. It will be operated by the Turkish company Anadolu Tasfiyehanesi Anonim Sirketi, and the products, gasoline, kerosine, and fuel oils will be marketed primarily within Turkey.

Water Distillation Plant

The amount of fresh water produced by distillation is increasing rapidly. This is particularly so in arid countries, and aboard ship where it eliminates the need for large water storage tanks.

The water distillation plant manufactured by Bennis Thermoflash Ltd is described in a new booklet which is available from the Company at Little Hulton, Walkden, Manchester. It includes details of land based units and marine units for steam and diesel-powered ships.

Molybdenized Lubricants

Rocol Ltd recently issued an advisory publication entitled *Applications of Rocol Molybdenized Products in Conventional Power Stations*. It is divided into three main sections dealing with boilers and associated equipment, turbines, and coal handling and preparation conveyor systems.

Copies can be obtained from the company at Rocol House, Swillington, Leeds.

Aerosol-Packed Silicone Grease

Silicone grease *MS4*, produced by Midland Silicones Ltd, is now being marketed in an aerosol pack, under the name *Ambersil MS4*. *MS4* is claimed to have good dielectric properties, be highly water-repellent and oxidation-resistant, with a working temperature range from −50 C to +200 C. It is used to protect ignition systems by excluding moisture and preventing electrical leakages along insulation surfaces under moisture condensing conditions.

Cooling Tower Plastic Packing

Polygrid is a new high efficiency corrosion resistant plastic packing used in Head Wrighton Fluor "Counterflo" cooling towers, which can also be installed in established mechanical or natural draught towers of all types. It is a moulded unit 3 ft square, and units staggered in layers throughout the packing height of the tower break up hot water into droplets as it cascades over the packing to give both splash and film-type cooling.

It is available in high impact polystyrene for resistance to water, acids, salts and alkalies, and in high density polyethylene for water contaminated by aromatic hydrocarbons and is designed and sold by Head Wrightson Processes Ltd.

A Review of the Year in Pictures

Laing Year 1960–61 is a pictorial record of some of the major projects undertaken by John Laing & Son. It includes impressive pictures of cathedrals and motorways in Britain, bridges in Canada, and a hydro-electric scheme in Northern Rhodesia. The Laing Organization comprises eight construction companies, three property development companies, and seven manufacturing companies.

Fire Protection

The total number of fires in the United Kingdom has doubled since 1938 and fire damage now costs more than £44 million each year.

These figures are given in the latest *Fire Fighting News* published by Nu-Swift Ltd. It includes technical descriptions of some of the Company's fire extinguishers and describes the services it offers.

Measuring Noise in Central London

The London County Council and Building Research Station of the DSIR have initiated the most thorough noise investigation ever undertaken in Central London. Two vans, equipped with Dawe Type 1405A objective noise meters and Dawe Type 1406D high-speed level recorders, are making 24-hr noise checks at 500 points throughout the whole of the area. The investigation is intended to gauge the size of the noise problem, and is regarded as a first step towards combating it.

Meg Products New Address

The Meg Products Division of Mandrel Industries, Inc is now located at 1238 Weller-Seattle, Washington.

U.S. Filteraids for Europe

A new plant was recently commissioned at Ghent, for the production of perlite filteraids, by Dicalite Europe Nord, a subsidiary of Great Lakes Carbon Corp. Perlite is a dense glassy rock formed by volcanic action. When crushed and heated under proper conditions, it expands to twenty or more times its original volume. Further treatment produces a mass of irregular fragmented particles which interlock to form an incompressible filter cake of 80 per cent to 90 per cent void space, capable of screening particles of less than one micron in size.

F. W. Berk & Co. Ltd is marketing Dicalite perlite filteraids in the United Kingdom.

The United Steel Companies in 1960

Employees of the United Steel Companies Ltd have received a colourfully illustrated booklet discussing the Group's activities in 1960. It includes a review of the state of the home and export markets as well as a reproduction of the balance sheet. The Distington iron foundry is reported to have exceeded the European production record for ingot mould foundries, with an output of 2704 tons in one week.

FOR SALE

WATERFOG and Waterspray Installations, automatic or non-automatic, designed and installed for Fire Fighting. Also complete Foam Installations. Fire Armour Limited, 9 George Street, London, W.1.

SITUATIONS VACANT

Geological Survey and Museum (D.S.I.R.), London, S.W.7, requires **Geophysicists** as Experimental Officers and Assistant Experimental Officers. Duties mainly concern outdoor geophysical surveys anywhere in the United Kingdom. Quals.: (E.O.) Pass degree or equiv. in Geology with ancillary Physics or Maths., or in Physics or Maths. with ancillary Geology. (A.E.O.)—G.C.E. "A" level in Geology, Maths. or Physics, and in another science subject. Over 22, pass degree expected. Salary ranges: E.O. £1,147–£1,396. A.E.O. £503 (age 18)–£856–(age 26)–£1,038. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting G.98/1A. Closing date 19 May 1961.

SERVICES AVAILABLE

Drawing office design and tracing capacity available for piping, electrical and instrumentation installations for oil refineries and similar plants and projects. All work supervised by competent experienced engineers, apply by telephone Lee Green 3416 or write Wellen (Engineers) Ltd, 89 High Street, S.E.13.

FILTER PRESSES

Illustrated is a Cast Iron 31½" sq. 'KJ" Filter Press with a closed delivery outlet. The filter is suitable for use with a full range of filter cloths, and for polishing or additional clarity filter papers can be used. Filter Presses are also made in Stainless Steel, Aluminium, Gunmetal and Timber in a variety of designs and are provided with suitable pumping machinery.

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THE DRYDEN ENGINEERING CO. (PTY.) LTD.,
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Illustration shows 65,000 ton tanker OLYMPIC CHALLENGER approaching No. 10 Jetty at Thames Haven on March 1st, 1960, to discharge her cargo of Kuwait crude oil. The OLYMPIC CHALLENGER is the largest ship ever to sail up the River Thames.

LONDON & THAMES HAVEN OIL WHARVES LTD
BUCKLERSBURY HOUSE, 83 CANNON STREET, E.C.4. TEL: CITY 7931
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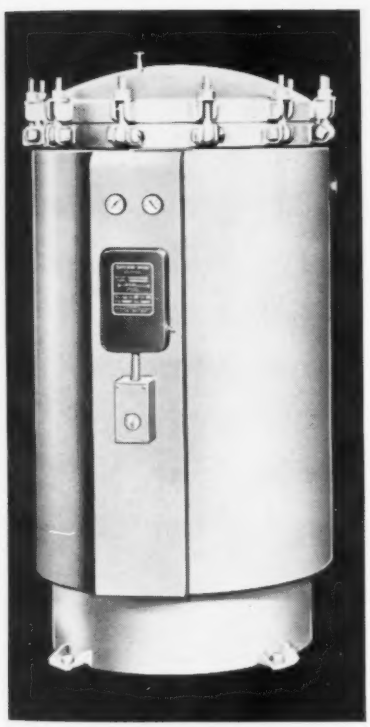
Let's tell 'em about the 'C' Type filter Mr B



don't forget the heaters Mr D

"The 'C' Type Birfield-Hilco oil filter", answers Les Brown, "is designed for high flow rate filtration for virtually all forms of oils, whether for small stationery diesel engines or for giant rolling mills."

On the question of heaters for filtration, Dave Davies advises: "Filters without heaters (Models FC and HFC) are ideal for solvents, fuel oils or lube oil which can be delivered to the filter at viscosities up to 300 Redwood No. 1 or a minimum temperature of 120 F. With heavy oil below 120 F. it is wise to use filters with heaters, particularly where the oil viscosity is above 260 Redwood No. 1."

Les Brown and Dave Davies head the only British oil filtration advisory service of its kind —contact them personally . . . ring MIDland 7961 today!

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OIL FILTRATION AND RECLAMATION EQUIPMENT

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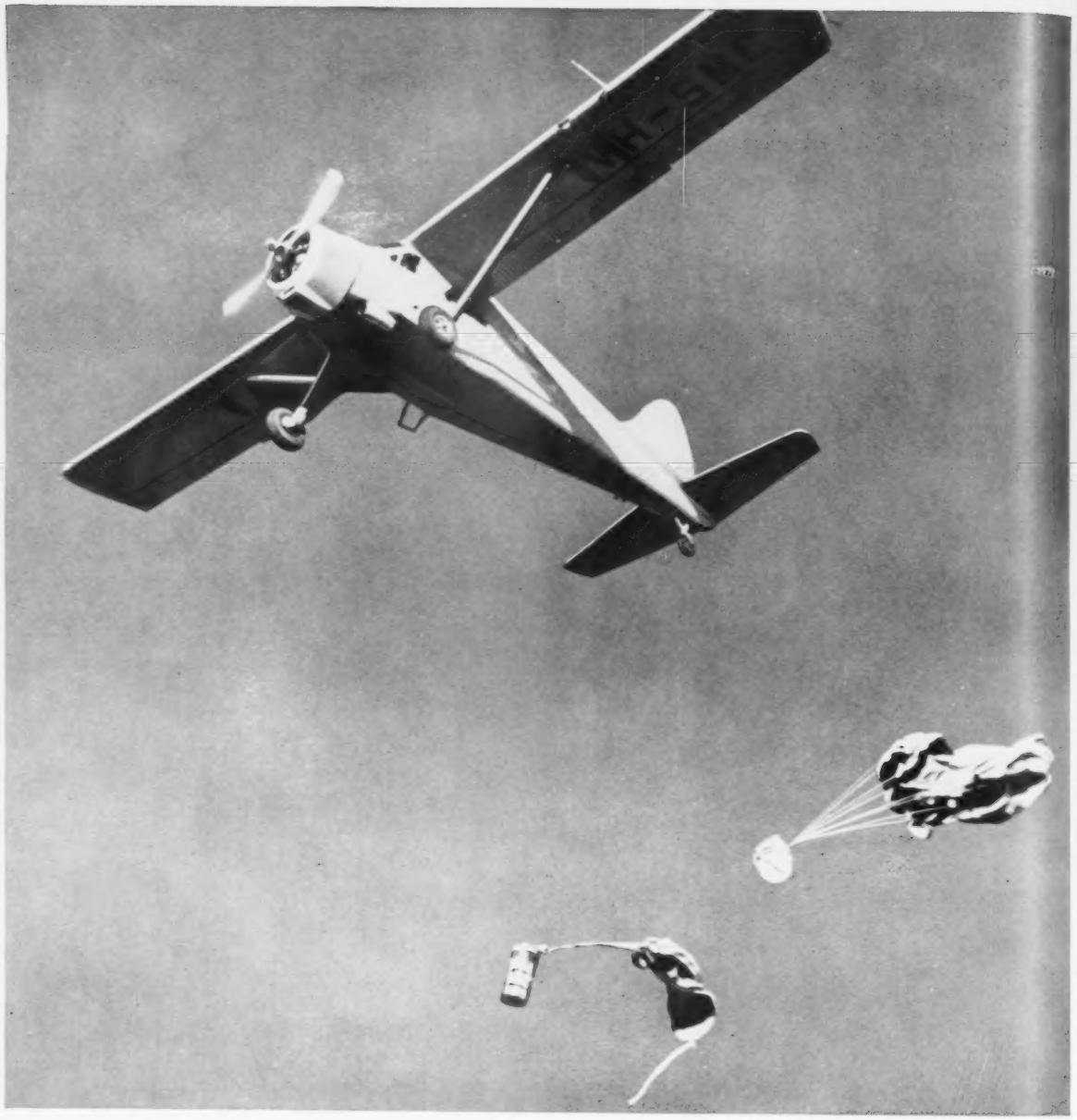
'C' SERIES FILTERS

'B' SERIES FILTERS

DUPLEX FILTERS

000 SERIES FILTERS



Airlift Australia

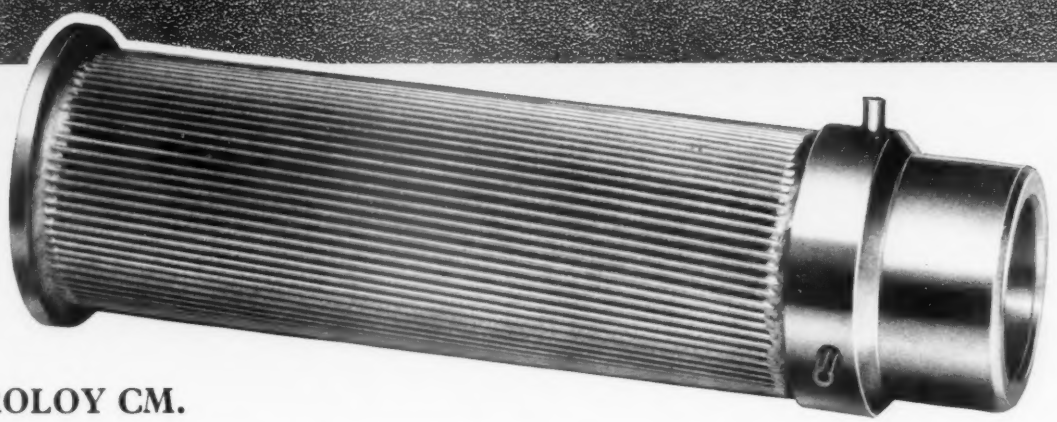
AUSTRALIA'S Snowy Mountains Scheme has presented some unusual challenges to BP as sole supplier of petroleum products. Some of these challenges have been met in unusual ways, such as fuel drops from aircraft.

This gigantic project, midway between Sydney and Melbourne, with its great dams, power stations, and miles of tunnels and aqueducts, is designed both to provide hydro-electricity and to divert irrigation water westwards into the parched plains.

British Petroleum is proud to be associated with the Snowy Mountains Scheme, one of the world's greatest engineering undertakings.

BP

Vokes new filter media with guaranteed 100% efficiency



POROLOY CM.

Vokes now introduce a new all-metal filter medium of outstanding efficiency for the *controlled* filtration of hydraulic and lubricating oils, fuels, air, gases, acids, caustics and related caustic materials, chemicals and solvents at extreme temperatures and pressures. Poroloy CM filter elements can be made in any size or shape from a variety of metals – Stainless Steel, Inconel, Nickel, Copper, Steel and Nichrome being the most popular—features which, combined with special production techniques to give controlled pore configuration, enable filters to be individually designed for special applications. Metals can be selected with the particular requirements of the application in mind and the size of the pores can be controlled to deal with particles of between 2 and 250 microns. Poroloy CM filters are therefore 100% effective against a stated particle size, *the danger of media migration being eliminated by an accurately controlled sintering process.* The ultimate tensile strength of the elements varies from 2,000 to 60,000 p.s.i. and the operating temperature range is from —400 F to 1200 F.

The unique combination of properties found in Poroloy CM has led to its recent use in critical temperature conditions in the United States missile and aircraft industries, including installation in the Boeing 707.

POROLOY T.

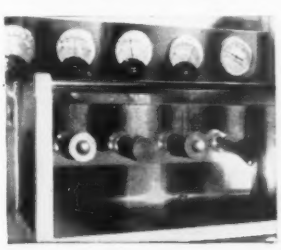
Similar in performance to Poroloy CM but manufactured by a different process, Poroloy T has an operating temperature range from —400 F to 1500 F. Pore size ratings are from 2 to 250 microns and tensile strength varies from 2,000 to 100,000 p.s.i.

The illustration (above right) shows the many sizes and forms—seamless tubes, flat discs, corrugated elements etc.—in which Poroloy can be manufactured.

Both filter elements are manufactured in conditions of micro-cleanliness and before despatch are individually checked for performance in the bubble point testing equipment (right).

Poroloy was developed by the California Institute of Technology and is manufactured in the U.K. under license from The Bendix Corporation, U.S.A.

Write now for fully illustrated technical literature.



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b. Beldamok. High grade asbestos yarn — brass wire reinforced — fine flake graphite and a special grade of lubricating oil. Can be used at temperatures up to 650°F and steam pressures to 1,000 p.s.i.

c. Lascarflon White. Composed of White Chrysotile Asbestos yarn which is thoroughly impregnated with P.T.F.E. — low co-efficient of friction and high resistance to all acids, alkalis and solvents to 300°C.

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1. Lindars Certified Intrinsically-safe circuits ensure high accuracy with safe, economical and speedy operation.
2. Remote control of Grade and Quantity of Oil delivered to each tanker in the Loading Bay.
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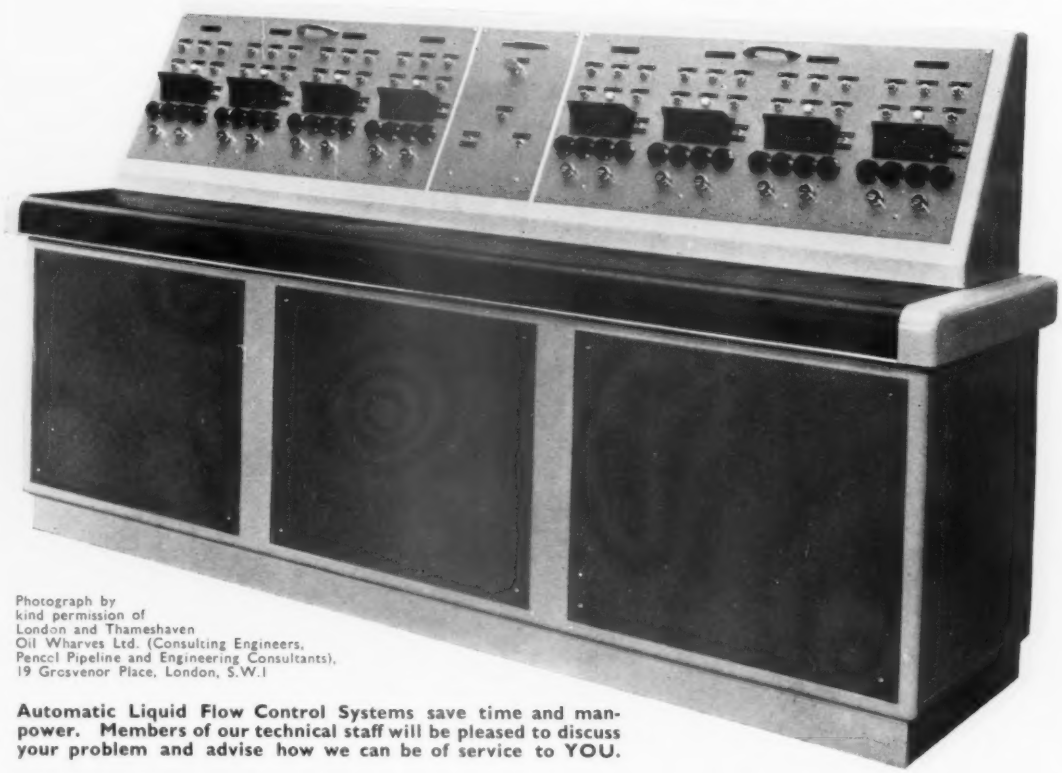
Illustration of typical control desk.



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Automatic Liquid Flow Control Systems save time and man-power. Members of our technical staff will be pleased to discuss your problem and advise how we can be of service to YOU.

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power supply...
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This outstanding Honeywell development offers virtually every industry the benefits of automatic process control using miniature instrumentation. ElectriK Tel-O-Set systems use 4-20 milliamps D.C. transmission along a pair of wires that also carry the 42 volt D.C. supply. Among the many advantages are

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* elimination of external power at field mounted transmitter reduces initial capital outlay
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Fully integrated ElectriK Tel-O-Set systems can be constructed simply from a wide range of units to perform any process control function— up to three-mode control. They represent the greatest advance yet in industrial instrumentation.

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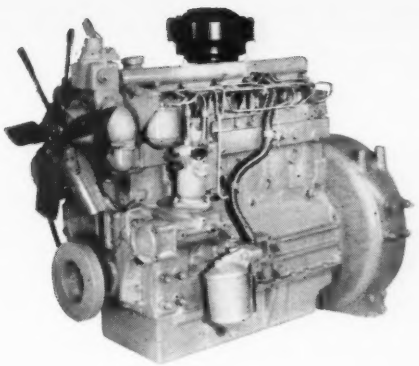

THE NEW Perkins SIX 354

THE MOST IMPORTANT NEW INDUSTRIAL ENGINE OF THE DECADE

The Perkins Six 354 has already been hailed by the technical press and by operators in exhaustive prototype tests as an outstanding engine in terms of power, performance and economy. It is suitable for all stationary and mobile plants including earth moving equipment, cranes, fork lift trucks, generators and welding sets. Comparatively small and compact for its power output, the Six 354 has excellent provision for power take-off.

- **Direct injection 5.8 litre**
- **Ratings up to 112 b.h.p. at 2800 r.p.m.**
- **Max. torque 260 lbs. ft. at 1450 r.p.m.**

PERKINS INDUSTRIAL ENGINES

TYPE	No. of Cyls.	Bore (ins.)	Stroke (ins.)	Swept Volume (cu. ins.)	Rating	R.P.M./GROSS B.H.P.								
						1000	1200	1500	1800	2000	2400	2800	3000	3600
Four 99(I)	4	3	3½	99	A	10.5	13.5	18	22	24.5	29	32	34	—
					B	12	15	20	24.4	27	32	35	38	—
					C	12	15.5	20.5	25	27	33	36	39	43
P3/144(I)	3	3½	5	144	A	16.5	20.5	25.5	30	33	—	—	—	—
					B	18.5	22.5	28	33	36	—	—	—	—
					C	18.5	23	29	34	37	42	—	—	—
Four 203(I)	4	3.6	5	203	A	25	30	38	44	47	—	—	—	—
					B	27.5	33	41	48	52	—	—	—	—
					C	28	34	43	50	54	60	—	—	—
Four 270(I)	4	4¼	4½	270	A	33	39	47	53	57	—	—	—	—
					B	36	43	52	58	62	—	—	—	—
P6(I)	6	3½	5	288	A	34	41	51	60	65	—	—	—	—
					B	37	45	56	66	72	—	—	—	—
					C	38	46	58	69	75	83	—	—	—
Six 305(I)	6	3.6	5	305	A	37	44	55	65	71	—	—	—	—
					B	40	49	61	72	78	—	—	—	—
					C	41	50	62	74	80	87	—	—	—
Six 354(I)	6	3.875	5	354	A	44	53	67	78	85	—	—	—	—
					B	48	58	73	86	93	—	—	—	—
					C	48	59	75	87	94	105	112	—	—
S6(I)	6	4¼	5	450	A	49	62	80	96	105	—	—	—	—
					B	54	68	88	106	115	—	—	—	—
					C	56	70	90	108	119	—	—	—	—

REMARKS

A. Denotes continuous rating to BS 649: 1958 conditions (85° F. and 29·5 hg). For every 10° above 85° F. this rating should be reduced by 2% and for every 1000 ft. above 500 ft. altitude the rating should be reduced by 3½%.

B. Denotes one hour rating to BS 649: 1958 conditions. See notes above re de-rating.

C. Denotes intermittent industrial rating to 60° F. and 30 in. hg conditions. Similar de-ratings should be made for temperature and altitude conditions.

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All Perkins engines are available under the unique Perpetuity plan, in which a factory rebuilt engine, equal in all respects to a new engine and carrying the same guarantee, is made available for immediate replacement at any period to suit the operators' requirements.

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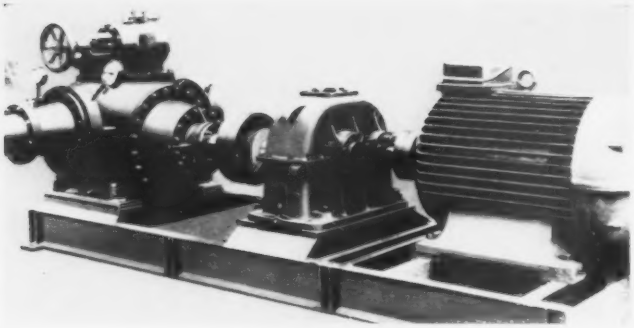
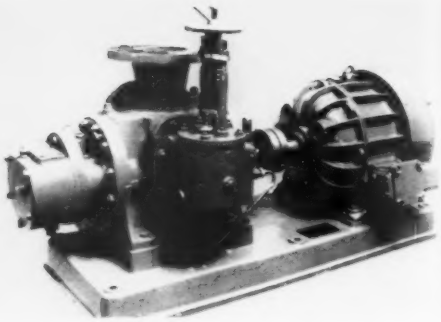




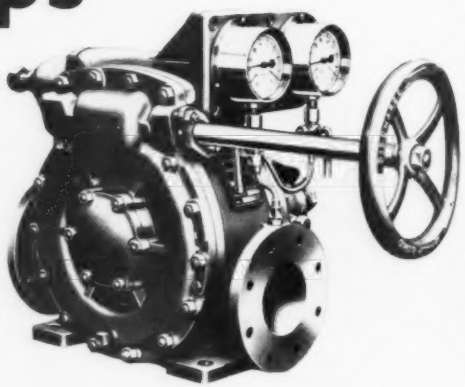
S & P Fuel Pumps

Stothert and Pitt Ltd. build a range of displacement pumps with capacities up to 1000 tons per hour designed to meet the special needs of the Petroleum Industry. By their ability to pump against a vacuum the pumps give reliable service when operating continuously under varying conditions of suction lift and viscosity.

Above right is a Screw Displacement Pump. Of all round clearance design, it has a high suction lift. The flow is pulsation free and the unit self-priming.

Above left is a Variable Output Rotary Piston Pump. It is almost pulseless and is electrically driven through a reduction gear box.

On the right is a Reversing Flow Rotary Displacement Pump for fitting on tank wagons. It is normally driven from the lorry power take-off.



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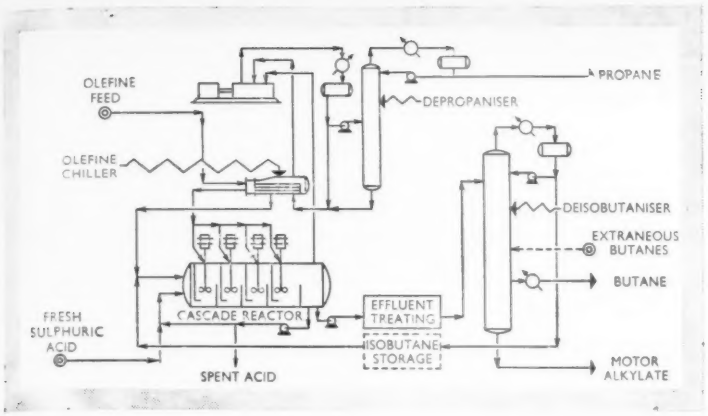

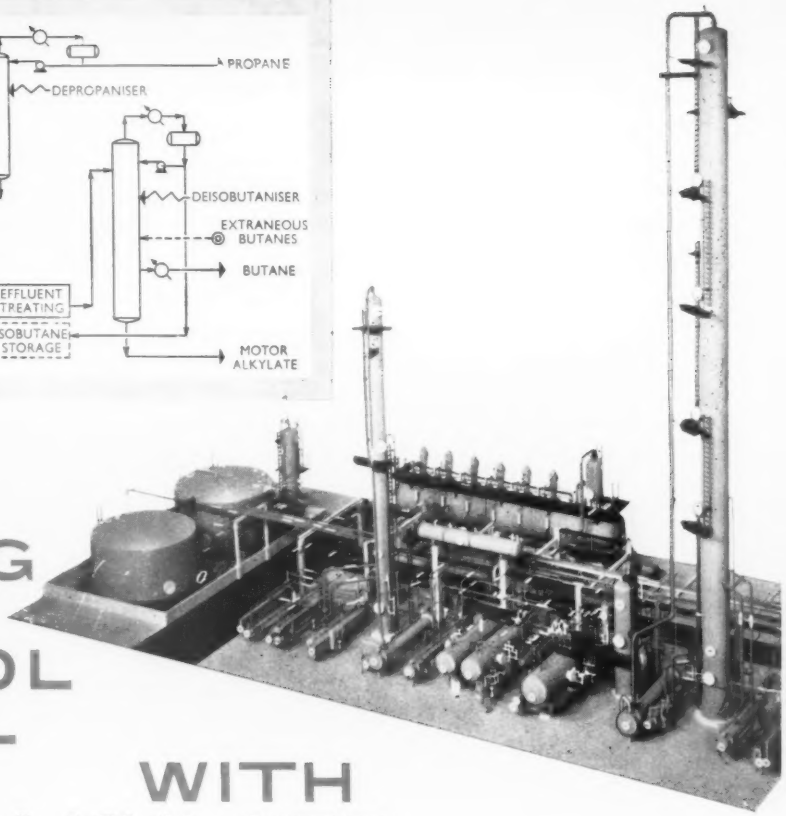

PRIMING THE PETROL POOL WITH ALKYLATE

More and more motorcars—and engines with higher compression ratios—these are creating a demand for higher octanes and for a higher quality petrol pool blend.

Both can be achieved, at a lower overall expenditure than ever before, by adding a Kellogg sulfuric acid alkylation unit to your plant. Designed to operate on butylene, propylene, amylene or a combination feed, these units offer many advantages over other designs. The most efficient, most economical and most flexible is the latest multi-stage cascade reactor design shown and described in brief right. It can produce an LPG product, without supplementary towers or equipment. It reduces corrosion to a minimum without extensive use of expensive chemicals. It uses less than 0.35 pounds sulfuric acid per gallon of butylene alkylate produced. It is adaptable to seasonal demands—capable of maintaining peak barrel octane production at minimum operating cost. It can produce specification butane without the addition of a debutanizer tower. These and other features are the result of improvements made through continuing development work, and of Kellogg's world-wide experience in alkylation. To date, Kellogg has designed, constructed or is working on 38 units in 7 countries with a total production capacity of over 141,000 BPD.

Kellogg International Corporation welcomes the opportunity of discussing alkylation in further detail with interested refinery engineers.

Process Description

The olefine feed is chilled and split into parallel streams and fed to separate reaction zones in the Cascade Reactor. Vaporization in each zone removes the heat of reaction and economically maintains low temperatures by auto-refrigeration. Condensed refrigerant is depropanized and mixed with recycle isobutane and acid catalyst. This mixture flows in series through the reaction zones. The effect is of many reactors, each receiving the total recycle plus refrigerant isobutane (used to aid the reaction and to provide refrigeration).

Reactor effluent containing reaction products, recycle isobutane and inert components, is separated from the acid catalyst in the reactor's settling zone, treated to remove entrained acidic material and fractionated to separate isobutane recycle, butane and motor alkylate. Total alkylate product can be added directly to petrol pool or rerun for use in aviation petrol.

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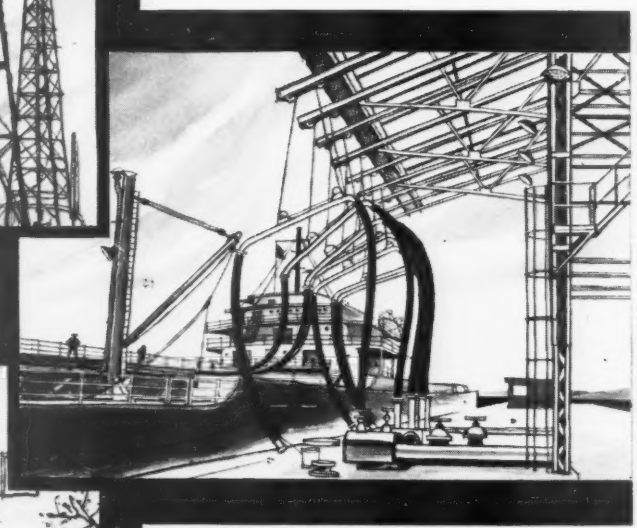
From PRODUCTION



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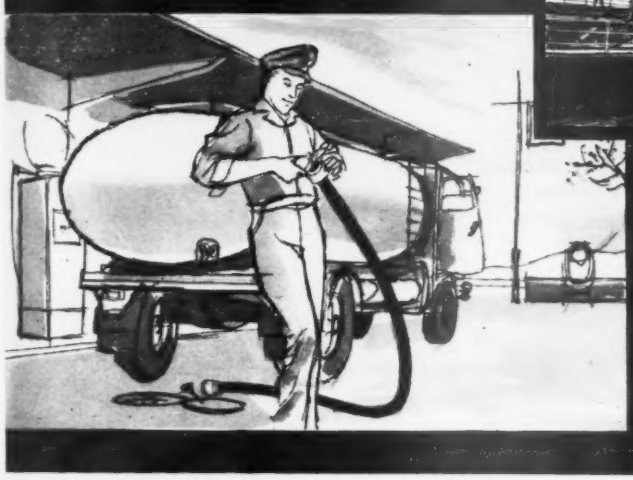

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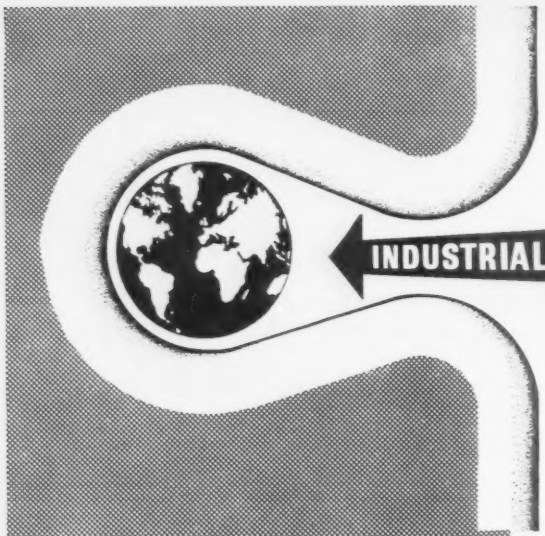

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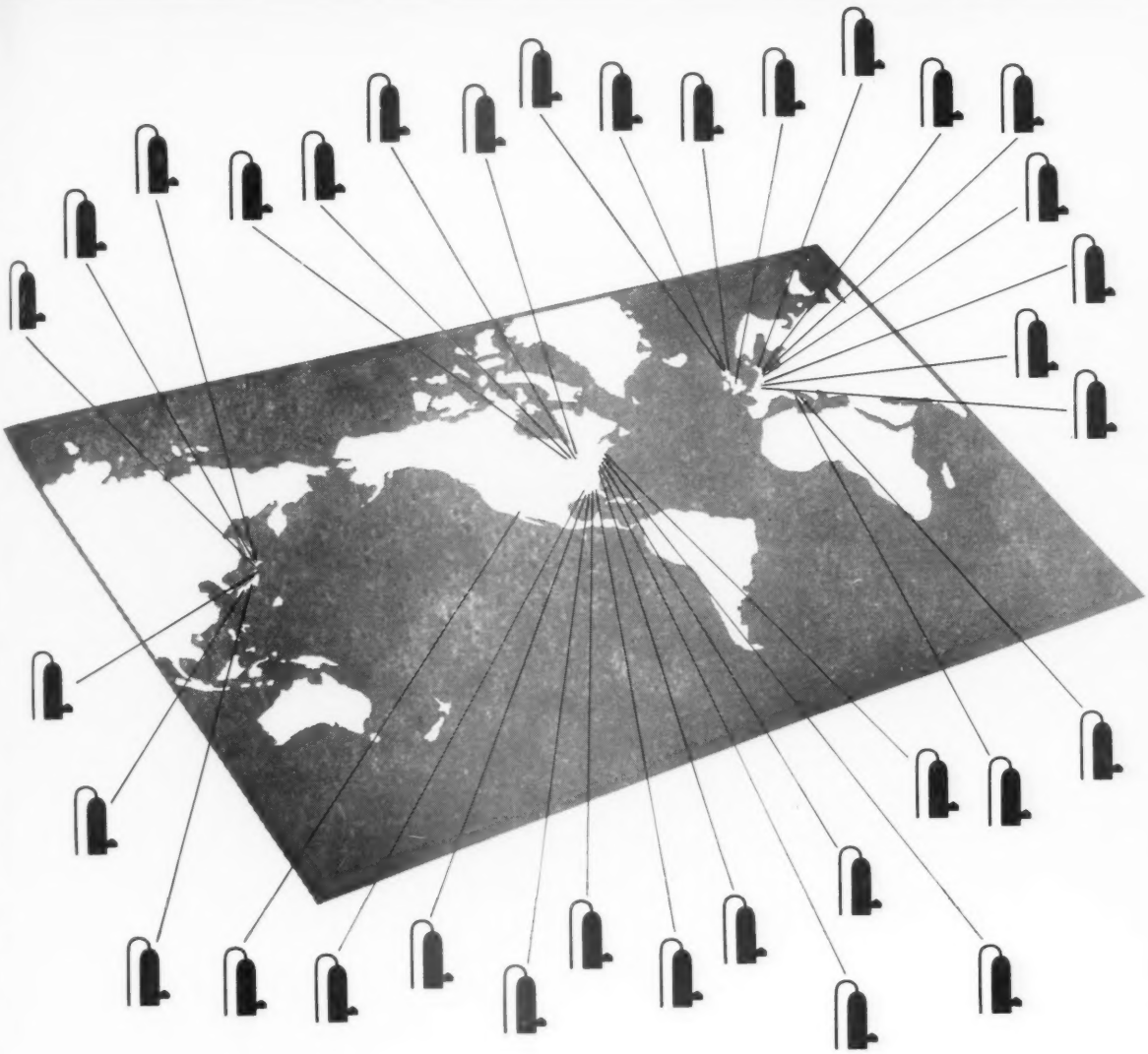

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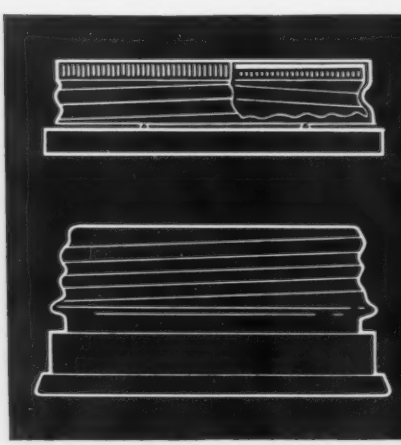

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